

REPORT  
OF  
HYDROMETRIC SURVEYS  
(STREAM MEASUREMENTS)  
FOR  
THE CALENDAR YEAR 1915

PREPARED UNDER THE DIRECTION OF  
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1917.





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*To Field Marshal, His Royal Highness Prince Arthur William Patrick Albert, Duke of Connaught and of Strathearn, K.G., K.T., K.P., etc., etc., etc., Governor-General and Commander-in-Chief of the Dominion of Canada.*

MAY IT PLEASE YOUR ROYAL HIGHNESS:

The undersigned has the honour to lay before Your Royal Highness the report of the Progress of Stream Measurements for the year 1915.

Respectfully submitted,

W. J. ROCHE.  
*Minister of the Interior.*

OTTAWA, June 12, 1916.



DEPARTMENT OF THE INTERIOR,

OTTAWA, June 12, 1916.

THE HONOURABLE W. J. ROCHE, M.D.,  
*Minister of the Interior.*

SIR:—

I have the honour to submit the report of Stream Measurements for the year 1915, and to recommend that it be published as the seventh of a series of progress reports.

I have the honour to be, Sir,

Your obedient servant,

W. W. CORY,  
*Deputy Minister of the Interior.*





DEPARTMENT OF THE INTERIOR,  
IRRIGATION BRANCH,

OTTAWA, June 7, 1916.

W. W. CORY, Esq., C.M.G.,  
*Deputy Minister of the Interior.*

SIR:—

I submit herewith the report of Stream Measurements for the year 1915, submitted by F. H. Peters, C.E., Commissioner of Irrigation, and would recommend that it be published.

Respectfully submitted,

E. F. DRAKE,  
*Superintendent of Irrigation.*

DEPARTMENT OF THE INTERIOR,  
IRRIGATION OFFICE,

CALGARY, ALBERTA, May 15, 1916.

E. F. DRAKE, Esq.,  
*Superintendent of Irrigation,*  
Department of the Interior,  
Ottawa, Canada.

SIR:—

I have the honour to transmit herewith the manuscript of the Report of the Progress of Stream Measurements for the calendar year 1915. This report has been prepared, under my direction, by P. M. Sauder, M. Can. Soc. C.E., Chief Hydrometric Engineer, G. H. Whyte, and N. M. Sutherland.

I beg to recommend that it be published as the seventh of the series of Reports of Progress of Stream Measurements.

I have the honour to be, Sir,  
Your obedient servant,  
F. H. PETERS,  
*Commissioner of Irrigation.*

DEPARTMENT OF THE INTERIOR,  
IRRIGATION OFFICE,

CALGARY, ALBERTA, May 13th, 1916.

F. H. PETERS, Esq., D.L.S., M. Can. Soc. C.E.,  
*Commissioner of Irrigation,*  
Department of the Interior,  
Calgary, Alta.

SIR:—

I beg to submit herewith the manuscript of the Report of Progress of Stream Measurements for the calendar year 1915.

The introduction gives a brief outline of the methods of obtaining and compiling the data, but owing to the want of space and time, many of the details had to be omitted.

I beg to recommend that this report be published as the seventh of the series of Reports of Progress of Stream Measurements.

As Mr. Elliott went on Active Service in August last, and Mr. Sutherland only remained with us for a short period, most of the records were compiled under the supervision of Mr. G. H. Whyte. I beg therefore to bring to your attention the amount of work that devolved upon Mr. Whyte during the past year.

While our work has been kept going in spite of the war, there has been a very hearty response from the members of the staff to the call to arms, and over fifty per cent. of the original staff employed on the hydrometric survey has already gone on Active Service. I have no doubt that every one of them will be a credit to himself and country, and beg therefore to recommend that the "Honour Roll" of the Irrigation Branch be published as a frontispiece in this report instead of the usual photograph.

I have the honour to be, Sir,  
Your obedient servant,  
P. M. SAUDER,  
*Chief Hydrometric Engineer*



# REPORT

OF

## PROGRESS OF STREAM MEASUREMENTS FOR THE CALENDAR YEAR 1915.

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By P. M. SAUDER, G. H. WHYTE and N. M. SUTHERLAND.

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### INTRODUCTION.

#### SCOPE OF WORK.

The chief features of the stream measurement work are the collection of data relating to the flow of surface waters and a study of the conditions affecting this flow. Information is also collected concerning river profiles, the duration and magnitude of floods, irrigation and water-power development, storage, seepage, etc., which may be of use in hydrometric studies.

This information is obtained by a series of observations at regular gauging stations which are established at suitable points. The selection of sites for these gauging stations and their maintenance depend largely upon the physical features and needs of the locality. If water is to be used for irrigation purposes the summer flow receives special attention; where it is required for power purposes, it becomes necessary to determine the minimum flow; if water is to be stored, information is obtained regarding the maximum flow. In all cases the duration of the different stages of the streams is recorded. Throughout the country gauging stations are maintained for general statistical purposes, to show the conditions existing through long periods. They are also used as primary stations, and their records in connection with short series of measurements will serve as bases for estimating the flow at other points in the drainage basin.

During the open water season of 1915, records were taken at one hundred and eighty-four (184) regular gauging stations on various streams in Alberta and Saskatchewan and at one hundred and fifteen (115) regular gauging stations on irrigation ditches and canals. Winter records, which are so valuable for power investigations and municipal water supplies, received special attention, and records were secured on almost all the important streams in the two provinces throughout the year.

#### ORGANIZATION.

The methods of carrying on the investigations were similar to those of previous years. Local residents were engaged to observe the gauge heights at regular stations. These observations were recorded in a book supplied by the department, and at the end of each week the observer copied the week's records on a postal card which he forwarded to the Calgary office by the first convenient mail.

District hydrometric engineers made regular visits to the gauging stations, usually once in every three weeks. On these visits they examined the observer's records, made discharge measurements and collected such information and data as would be of use in making estimates of the daily flow at the station. The results of the discharge measurements and all data collected were forwarded as soon as possible after being completed to the Calgary office, where all reports are copied on regular forms and filed.

During the winter no records were taken at a number of the gauging stations, which made it possible to reduce the field staff and have each engineer spend some time in the office and assist in the final computations and estimates of run-off. As far as possible the same engineer who did the field work made or checked the office computations, so as to eliminate any chance of error through lack of knowledge of the conditions at the gauging station.

Gauge height-area, gauge height-mean velocity, and gauge height-discharge curves were plotted and rating tables constructed. Tables of discharge measurements, daily gauge

height and discharge, and monthly discharge were also compiled. These records have been collected and are embodied in this, the Seventh Annual Report of Progress of Stream Measurements.

The organization during 1915 was also similar to the previous year, and the staff consisted of the chief hydrometric engineer, two assistant engineers, one recorder, one computer, and one clerk in the office, and fifteen assistant engineers in the field.

During 1915, the territory was divided for administrative purposes into thirteen districts, viz., Banff, Calgary, Macleod, Cardston, Milk River, Western Cypress Hills, Eastern Cypress Hills, Wood Mountain, Saskatoon, Edmonton, Nordegg, Jasper and Peace River. In each district there was one engineer, who while in the field employed temporary assistance and was equipped with the necessary gauging and surveying instruments. In Banff, Calgary, Macleod, Saskatoon, Edmonton and Jasper districts, the engineers travelled by train and hired livery, and stopped at hotels and stopping houses; while in the Cardston, Milk River, Western Cypress Hills, Eastern Cypress Hills and Wood Mountain districts they were supplied with a team, democrat and camping outfit. The engineer in the Nordegg district was supplied with a pack train, while the engineer in the Peace River district travelled largely by boat. One engineer was employed in an investigation of absorption losses in irrigation canals, and other experimental work. The thirteenth engineer was employed at rating current-meters, gauging the streams at Calgary and other local work. During the early spring, three of the irrigation inspecting engineers assisted in collecting records of the early spring run-off in the Cypress hills.

At the beginning of 1916, the organization of the staff under the Chief Hydrometric Engineer was changed, and the whole territory and work was divided into two divisions, namely, Northern and Southern. An engineer, designated the Divisional Hydrometric Engineer, was placed in charge of each division, and was given a staff consisting of one field engineer for each district in his division, an office engineer, and a recorder. This increases the office staff, and it is planned that the divisional engineers shall spend considerable time in field supervision.

#### BANFF DISTRICT.

This district included the following regular gauging stations.

Stream	Location	Date Established
Bath Creek	NE. 32-28-16-5	April 9, 1913
Bow River	SE. 28-28-16-5 <sup>a</sup>	July 18, 1910
Bow River	SE. 35-25-12-5	May 25, 1909
Bow River	NW. 32-24-8-5	March 10, 1912
Cascade River	SE. 19-26-11-5	August 16, 1911
Fortymile Creek	SW. 2-26-12-5	July 31, 1912
Ghost River	NE. 23-26-6-5	August 17, 1911
Jumpingpound Creek	SE. 30-24-4-5	May 7, 1908
Kananaskis River	SW. 34-24-8-5 <sup>b</sup>	August 31, 1911
Louise Creek	NE. 20-28-16-5	July 5, 1913
Pipestone River	SW. 27-28-16-5	August 31, 1911
Spray River	SE. 31-22-10-5	July 23, 1914
Spray Creek	SW. 32-22-10-5	July 24, 1914
Spray River	SW. 25-25-12-5	July 15, 1910

Records have been obtained throughout the year on all the above stations excepting those on Bath Creek, Spray River (SE. 32-22-10-5), and Spray Creek, where observers were not available during the winter months, and on Jumpingpound Creek, where only open water records were desired.

Miscellaneous gaugings were made of Beaupré Creek (NE. 15-26-5-5), Big Hill Creek (SW. 10-26-4-5), Chiniki Creek (near Morley), Grand Valley Creek (SW. 24-26-5-5), Horse Creek (NE. 8-26-4-5), Spencer Creek (SE. 18-26-5-5), Whiteman Creek, (NW. 24-24-11-5), and the tail-race of Lake Louise power house.

Floods of unusual size occurred on all streams in this district during June, causing considerable damage to property along their banks and adding much to the field and office work.

An automatic gauge was installed on Ghost River during the fall, but was not operated. It is expected that this gauge will give more accurate and continuous records on this important stream.

During the summer a cable station was erected on Spray River (SE. 31-22-10-5), which will enable us to obtain records during high water at this point.

The field work in this district was under the charge of H. C. Ritchie, A.M. Can. Soc. C.E., O. H. Hoover, B.A.Sc., and J. E. Caughey, B.Sc. The final computations for this report were made by H. C. Ritchie and A. B. Cook.

<sup>a</sup> This station was originally located on NE. 28-28-16-5, but was moved to its present position on August 31, 1911.

<sup>b</sup> This station was originally located on NW. 32-24-8-5, but was moved to its present position on May 13, 1913.

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## CALGARY DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Bow River.....	NE. 32-21-25-4a	Sept. 1909
Bow River.....	SE. 2-21-19-4b	August 20, 1909
Bullshead Creek.....	SE. 16-12-5-4	July 26, 1909
E. B. Canadian Pacific Railway Company Canal.....	SE. 3-21-18-4	June 6, 1914
N. B. Canadian Pacific Railway Company Canal.....	NW. 3-21-18-4	June 6, 1914
Elbow River.....	NW. 12-23-5-5	Sept. 29, 1914
Fish Creek.....	SW. 26-22-3-5	May 13, 1907
Findlay and McDougal Ditch.....	SW. 31-18-29-4	June 17, 1911
Highwood River.....	SE. 20-18-2-5	July 27, 1912
Highwood River.....	NW. 6-19-28-4	May 28, 1908
Highwood River.....	NW. 17-20-28-4	October 3, 1911
Little Bow Ditch.....	SW. 6-19-28-4	August 1, 1910
Pekisko Creek.....	NW. 8-17-2-5	October 6, 1911
Red Deer River.....	NW. 11-29-20-4	Oct. 25, 1915
Ross Creek.....	NW. 31-11-2-4	July 28, 1909
South Saskatchewan River.....	NW. 31-12-5-4	May 31, 1911
Sevenpersons River.....	NE. 30-12-5-4	April 27, 1910
Sheep River.....	NW. 22-20-29-4	May 25, 1908
N. Br. Sheep River.....	SW. 12-21-3-5	May 22, 1908
S. Br. Sheep River.....	SW. 17-20-2-5	May 23, 1908
Stimson Creek.....	NW. 2-17-2-5c	Oct. 6, 1911

Miscellaneous gaugings were made of a number of branch canals of the Canadian Pacific Railway Company's Irrigation systems, South Branch of Fish Creek (SE. 22-22-3-5), Lineham Spillway at High River, and several springs.

The stations in the immediate vicinity of Calgary were in charge of the rating station engineer.

Most of the streams in this district were subject to floods during the year. These floods changed the discharge curves and also caused some damage to station equipments and considerable damage to property along their banks.

The first suspension bridge erected by this survey was constructed on Fish Creek during November, to enable satisfactory measurements being made during high stages.

The Calgary winter district included only Bow River (SE. 2-21-19-4), E. B. Canadian Pacific Railway Company Canal, Elbow River, Highwood River (NW. 6-19-28-4), Little Bow Ditch and Red Deer River on the above list. The South Saskatchewan River was included in the Macleod district during the winter months.

H. S. Kerby, B.A.Sc., H. W. Rowley, B.Sc., R. J. McGuinness, H. B. R. Thompson and F. K. Beach, A. M. Can. Soc. C.E., had charge of this district for various periods, and R. J. McGuinness, W. H. Storey and G. H. Whyte made the final computations for this report.

## MACLEOD DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Canyon Creek.....	NE. 14-6-2-5	July 6, 1910
Carmichael Ditch.....	SE. 34-13-29-4	July 22, 1912
Castle River.....	SW. 2-7-1-5	August 5, 1909
Cow Creek.....	NE. 14-8-2-5	May 26, 1910
Crowsnest River.....	SW. 12-8-5-5	July 28, 1910
Crowsnest River.....	NE. 36-7-4-5	July 28, 1910
Crowsnest River.....	NE. 26-7-2-5	Sept. 7, 1907
Elton Ditch.....	NE. 19-8-1-5	July 10, 1912
Etzikom Coulee.....	SW. 3-7-49-4	April 16, 1914
Ford East Ditch.....	NE. 25-13-1-5	June 28, 1912
Ford West Ditch.....	NE. 26-13-1-5	June 28, 1912
Huff Ditch.....	NW. 30-8-1-5	July 11, 1912
McGillivray Creek.....	SE. 7-8-4-5	July 23, 1913
Mill Creek.....	SW. 18-6-1-5	July 7, 1910
Mosquito Creek.....	NE. 30-16-28-4	August 1, 1908
Muddypound Creek.....	SW. 27-11-28-4	July 27, 1908
Nanton Creek.....	SE. 19-16-28-4d	August 3, 1908

a This station was originally located on Sec. 31-21-25-4, but was moved to its present position in May, 1912.

b This station was originally located on Sec. 13-21-19-4, but was moved to its present position in May, 1913.

c This station was originally located on the SE. 14-17-2-5, but was moved to its present position on July 4, 1917.

d This station was originally located on the NE. 13-1-23-4, but was moved to its present position in May 1, 1913.

Stream	Location	Date Established
Oldman River.....	NE. 34-7-1-5	Sept. 15, 1908
Oldman River.....	NW. 10-9-26-4	July 12, 1910
Oldman (Belly) River.....	NW. 1-9-22-4	August 31, 1911
Pincher Creek.....	SW. 23-6-30-4	August 13, 1905
Riley Ditch.....	SW. 17-13-2-5	
St. Mary River.....	NE. 26-7-22-4	October 13, 1911
Todd Creek.....	SW. 19-8-1-5	August 3, 1909
Trout Creek.....	SE. 32-11-28-4	July 7, 1911
Willow Creek.....	SE. 26-9-26-4	July 1, 1909
Willow Creek.....	NE. 20-9-26-4	August 23, 1915

Miscellaneous gaugings were made of Allison Creek (SW. 11-8-5-5), Bellevue Creek (NE. 29-7-3-5), Blairmore Creek (SE. 3-8-4-5), Buchanan Spring (SE. 2-7-1-5), Connelly Creek (SE. 36-7-2-5), Canyon Creek (NW. 5-12-28-4), Castle River (NW. 16-5-3-5), Carbondale River SW. 14-6-3-5), Drumm Creek (NW. 18-7-3-5), Fortier Springs (SE. 17-7-1-5), Gold Creek (SE. 30-7-3-5), Lyon Creek (SE. 35-7-4-5), Nez Percé Creek (SE. 17-8-4-5), Starr Creek (SW. 7-8-4-5), Summit Creek (SW. 12-8-6-5), York Creek (NW. 34-7-4-5), and several other springs and creeks.

The streams in this district rising north of the Crowsnest pass were subject to floods during June, but did little damage.

The installation of an automatic gauge on the Oldman River (NW. 10-9-26-4) was commenced during the fall, and it is proposed to place a Stevens Continuous Water Stage Recorder at this station early in 1916.

Winter records were obtained on Castle River, Crowsnest River (three stations), Oldman River (three stations), St. Mary River and also of most of the creeks shown in the miscellaneous list. The Oldman River (NW. 1-9-22-4) and St. Mary River were added to the Cardston district while the South Saskatchewan River (NW. 31-12-5-4), Swiftcurrent Creek (SW. 12-15-14-3 and NW. 18-15-13-3) and Notukeu Creek were added to the Macleod district.

The field work in this district was in charge of J. E. Caughey, B.Sc., F. R. Steinberger, B.E., P. H. Daniels, B.Sc., and W. R. McCaffrey, B.A.Sc., for various periods and W. R. McCaffrey and W. H. Storey made the final computations for this report.

#### CARDSTON DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Alberta Railway and Irrigation Company Canal..	SE. 36-1-25-4	April 27, 1915
Alberta Railway and Irrigation Company Canal..	SE. 21-2-24-4	July 26, 1910
Alberta Railway and Irrigation Company Canal..	NW. 28-4-23-4	May 1, 1914
Belly River.....	NE. 5-2-28-4	Nov. 1, 1911
Belly River.....	SE. 21-6-25-4	May 27, 1909
Boundary Creek.....	NW. 20-1-26-4	June 18, 1913
Christianson Ditch.....	SE. 12-3-28-4	Sept. 14, 1911
Crooked Creek.....	SW. 22-2-29-4a	Sept. 15, 1909
Fidler Brothers' Ditch.....	SE. 19-1-26-4	Sept. 13, 1911
Lee Creek.....	SE. 27-2-26-4b	May 5, 1913
Mamí Creek.....	SE. 19-2-27-4	August 13, 1909
N. B. Milk River.....	NE. 11-1-23-4c	July 21, 1909
S. B. Milk River.....	SW. 20-37 N. 9 W. P. M. Montana, U.S.A.	By U.S. G. S. in 1905
Pinepound Creek.....	NE. 29-4-23-4	April 30, 1914
Pothole Creek.....	NE. 1-6-22-4	April 28, 1914
Pothole Creek.....	NW. 10-5-22-4	April 27, 1914
Rolph Creek near Kimball.....	SE. 21-2-24-4	May 17, 1911
St. Mary River.....	NW. 25-1-25-4	By A. R. I. Co., in 1905
Waterton River.....	NE. 8-2-29-4	August 26, 1908
Waterton River.....	NW. 28-6-25-4	Nov. 5, 1915

Miscellaneous gaugings were made on North, South and Middle Branches of Belly River (Montana), Bertha Creek (Waterton Lakes), Blackiston Brook (NE. 30-1-29-4), West Boundary Creek (Waterton Lakes), Boundary Creek (Waterton Lakes), Cameron (Oil) Creek (SW. 23-1-30-4), Cottonwood Creek (20-2-29-4), Drywood River (NW. 18-4-29-4), Hellroaring Creek (Waterton Lakes), Kootenai River (Waterton Lakes), Pine Creek (NW. 21-3-29-4) and Yarrow Creek (14-4-29-4).

a This station was originally located on the SE. 22-2-29-4, but was moved to the SW. 23-2-29-4 on June 15, 1911, and to its present position on October 15, 1912.

b A station was maintained on the NW. 10-3-25-4 from June 28, 1909, to July 13, 1914.

c This station was originally located on the NE. 13-1-23-4, but was moved to its present position on May 1, 1913.

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Winter observations were made on Belly River (two stations), Blackiston Brook, Cameron Creek, Lee Creek, North and South Branches of Milk River, St. Mary River and Waterton River (two stations). In addition, the winter district included Milk River (NE. 21-2-16-4), Oldman River (NW. 1-9-22-4), and St. Mary River (NE. 26-7-22-4).

The stations on St. Mary (NW. 25-1-25-4) and North and South Branches of Milk River are equipped with automatic gauges and are maintained jointly by this branch, with Water Resources Branch of the United States Geological Survey.

A new station was established on Waterton River near its mouth, and a cable installed in November. This will enable us to obtain more complete records of the flow of this stream.

O. H. Hoover, B.A.Sc., J. E. Degnan, V. A. Newhall, B.A.Sc., and W. H. Storey were in charge of this district for various periods. The final computations for the report were made by V. A. Newhall, W. H. Storey and G. H. Whyte.

## MILK RIVER DISTRICT.

Stream	Location	Date Established
Deer Creek.....	SW. 15-1-12-4	May 26, 1911
Deer Creek Cattle Company East Ditch.....	SW. 36-1-12-4	April 27, 1912
Deer Creek Cattle Company West Ditch.....	SW. 36-1-12-4	April 30, 1914
Etzikom Coulee.....	SW. 2-5-13-4	May 28, 1915
Fornfeist Ditch.....	SW. 31-1-11-4	Sept. 16, 1915
Hooper and Huckvale North Ditch.....	SW. 27-4-6-4	March 7, 1914
Hooper and Huckvale South Ditch.....	NE. 22-4-6-4	May 2, 1912
Ketchum Creek.....	NE. 25-4-7-4	May 17, 1915
Manyberries Creek.....	SW. 27-4-6-4a	June 17, 1910
Milk River.....	NE. 21-2-16-4	May 18, 1909
Milk River.....	SW. 35-1-13-4	August 2, 1909
Milk River.....	SW. 21-2-8-4	August 5, 1909
Milk River.....	{ NE. 6-37 N. 9 E. P. M. } Montana, U.S.A. <sup>b</sup>	August 7, 1909
N. Br. Milk River.....	SW. 19-2-18-4	July 15, 1909
S. Br. Milk River.....	NW. 31-1-18-4	July 14, 1909

Miscellaneous gaugings were made of Beargulch (30-2-9-4), Canal Creek (6-4-6-4 and 27-3-6-4), Dead Creek (SW. 22-4-6-4), Deadhorse Creek (4-2-11-4), Deer Creek (NE. 26-1-12-4), Davis Coulee (SE. 35-1-13-4), Irrigation Creek (7-6-5-4), Halfbreed Creek (28-2-10-4), Ketchum Creek (16-4-6-4, 10-4-6-4 and 35-4-7-4), Kennedy Creek (SE. 3-1-5-4), Lost River (11-2-5-4), Manyberries Creek (3-5-7-4 and 31-4-6-4), Macdonald Creek (32-1-11-4), Mackie Creek (19-2-18-4), Miners Creek (11-2-11-4), Police Creek (SW. 35-1-13-4), Red Creek (18-1-15-4), Rocky Coulee (SW. 35-1-13-4), Verdigris Coulee (SE. 29-2-14-4), and several other creeks, springs and coulees.

Winter records were obtained at only one station, Milk River (NE. 21-2-16-4), which was included in Cardston district during the winter period.

The lowest station on Milk River is equipped with an automatic gauge and is maintained in co-operation with the United States Geological Survey.

W. H. Storey was in charge of the field work in this district and made the final computations for this report.

## WESTERN CYPRESS HILLS DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Adams North Ditch.....	NE. 10-9-27-3	May 22, 1914
Adams South Ditch.....	NE. 10-9-27-3	May 22, 1914
Anderson Ditch.....	SW. 23-6-3-4	Sept. 23, 1911
Battle Creek.....	NE. 33-5-29-3	June 3, 1909
Battle Creek.....	NW. 33-5-27-3c	July 5, 1910
Battle Creek.....	NE. 3-3-27-3	May 11, 1910
Boxelder Creek.....	NE. 2-12-30-3	May 24, 1909
Brown Ditch.....	NW. 31-8-3-4	October 14, 1915
Bullshead Creek.....	SW. 4-11-5-4d	October 9, 1911
Cheeseman West Ditch.....	SW. 12-8-29-3	June 24, 1911
Cheeseman East Ditch.....	SW. 12-8-29-3	June 24, 1911
Clark Ditch.....	SE. 15-9-5-4	October 15, 1915
M. T. Clark North Ditch.....	SW. 21-7-3-4	Sept. 28, 1915

a This station was originally located on SE. 3-5-6-4, but was moved to its present position on May 2, 1912.

b This station was originally located on SE. 3-1-5-4, but was moved to its present position in spring of 1913.

c This station was originally located on SW. 2-6-28-3, but was moved to its present position on May 29, 1912.

d This station was originally located on NW. 15-9-5-4, but was moved to its present position on May 15, 1913.



Stream	Location	Date Established
M. T. Clark South Ditch	SW. 21-7-3-4	Sept. 28, 1915
Dixon Ditch	SE. 17-12-26-3	June 4, 1911
English Ditch	SW. 12-7-3-4	Sept. 29, 1915
Gaff Ditch	SW. 25-5-29-3	July 11, 1911
Gap Creek	SE. 4-10-27-3	April 25, 1909
Gilchrist Bros. Ditch	SW. 11-5-27-3	October 16, 1911
Gordon, Ironsides and Fares Ditch	NW. 7-12-22-3	June 14, 1915
Gregg Ditch	NE. 34-3-29-3	July 30, 1915
D. A. Hammond Ditch	NE. 5-2-29-3	August 2, 1915
Hanckel Ditch	NE. 30-7-3-4	October 4, 1915
Hartt Ditch	NE. 15-6-3-4	Sept. 27, 1915
Henry Ditch	NW. 28-5-28-3	July 7, 1914
Henry Ditch	NW. 34-5-28-3	July 7, 1914
Lindner Ditch	NW. 10-6-29-3	July 26, 1910
N. B. Link East Ditch	SW. 32-5-1-4	July 25, 1914
S. B. Link East Ditch	SW. 32-5-1-4	July 25, 1914
Link West Ditch	SW. 32-5-1-4	July 25, 1914
Lodge Creek	SE. 12-1-29-3	August 13, 1909
E. Br. Lodge Creek	SE. 1-7-3-4	October 17, 1911
Lynch Ditch	NE. 19-2-29-3	August 2, 1915
Mackay Creek	NW. 26-11-1-4	July 29, 1909
Maple Creek	SE. 28-11-26-3	May 4, 1910
Maple Creek	NE. 5-12-26-3	April 28, 1915
Marshall and Gaff Ditch	NE. 33-5-29-3	July 11, 1911
McCann Ditch	NE. 29-5-1-4	July 13, 1915
McKinnon Ditch	NW. 20-4-26-3	October 20, 1911
Middle Creek	SW. 30-5-29-3	July 20, 1909
Middle Creek	NE. 4-2-29-3	June 13, 1910
Mitchell Upper Ditch	NE. 29-5-2-4	July 6, 1915
Mitchell Lower Ditch	SE. 15-5-2-4	July 7, 1915
Mock Ditch	NW. 21-7-2-4	Sept. 29, 1915
Muir and Frantzen Ditch	SW. 36-5-2-4	July 6, 1915
Mudie Ditch	NW. 21-7-3-4	Sept. 28, 1915
Mull East Ditch	NW. 24-7-29-3	June 9, 1915
Mull West Ditch	NW. 24-7-29-3	June 9, 1915
Oxarart Creek	NE. 20-6-27-3	June 15, 1909
Parsonage Ditch	SW. 3-7-29-3	June 9, 1915
Peachey Ditch	SE. 4-3-29-3	July 29, 1915
G. Pollock East Ditch	SW. 17-9-27-3	May 19, 1914
G. Pollock West Ditch	SW. 17-9-27-3	May 19, 1914
Read Ditch from Michel Coulee	NE. 33-6-3-4	Sept. 28, 1915
Read Ditch from Read Creek	NE. 34-6-3-4	Sept. 27, 1915
Richardson Ditch	SE. 2-5-27-3	October 14, 1911
Sage Creek	NE. 9-1-2-4	August 10, 1909
Sixmile Coulee	SW. 6-7-28-3a	July 22, 1909
Small Ditch	SE. 22-9-27-3	Nov. 22, 1915
Spangler Ditch near Govenlock	NW. 24-2-30-3	August 2, 1915
Spangler Ditch from Sixmile Coulee	SW. 6-7-28-3	July 10, 1911
Starks and Burton Ditch	SE. 17-11-5-4	October 9, 1911
Stirling and Nash Ditch	SE. 22-3-27-3	July 11, 1911
Suiste North Ditch	NE. 9-6-3-4	Sept. 27, 1915
Suiste South Ditch	NE. 4-6-3-4	Sept. 27, 1915
White Ditch	SW. 1-9-27-3	June 15, 1911
Wilson Ditch	NE. 34-5-28-3	June 21, 1911
Wood and Anderson Ditch	NE. 21-7-29-3	June 20, 1914
Wood and Anderson East Ditch	SE. 22-7-29-3	June 20, 1914
Wood and Anderson West Ditch	NE. 22-7-29-3	June 20, 1914

It will be noted that a new station was established on Maple Creek below the mouth of Gap Creek and that the station on Maple Creek on the Northeast quarter of Sec. 16, Tp. 11, Rge. 26, W. 3rd Mer., and the station on Gap Creek on the Northeast quarter of Sec. 31, Tp. 11, Rge. 26, W. 3rd Mer., have been abandoned.

At all these stations, with the exception of Sage Creek, some records were obtained. At a number of the ditch stations little or no water was used owing to the very wet season.

No winter records were obtained on any of the streams in this district during 1915.

Miscellaneous gaugings were made of Adams Springs (NW. 32-5-1-4), Link Spring (NW. 32-5-1-4), and a few other coulees and small creeks.

a This station was originally located on NW. 29-7-28-3, but was moved to its present position on July 4, 1911.



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Most of the flow of the streams in this district takes place in the early spring during the break up, and the district was covered during this period by three engineers. W. H. Rowley, B.Sc., was in charge of the work on the lower stations on Battle and Willow Creeks; H. R. Carscallen, B.A.Sc., those on the upper waters of Battle and Lodge Creeks; R. J. Srigley and H. B. R. Thompson, for various periods, those north of the Cypress Hills, west of Maple Creek. After the end of the freshet period, Mr. Rowley was in charge of the whole district, and, also made the final computations for this report. Mr Rowley also acted as water-master in this district, but owing to the abundance of rainfall his duties as water-master were very light.

## EASTERN CYPRESS HILLS DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Axtón Ditch from Spring Coulee.....	NE. 26-7-21-3	July 26, 1913
Barnett Ditch.....	SE. 17-7-22-3	July 26, 1915
Barroby Ditch.....	NE. 33-6-23-3	August 12, 1913
Bear Creek.....	SE. 18-11-23-3	June 22, 1908
Beveridge West Ditch.....	NW. 18-10-24-3	June 27, 1914
Belanger Creek.....	SW. 30-6-25-3a	March 31, 1912
Bolingbroke Ditch.....	NE. 7-7-22-3	August 11, 1913
Bone Creek.....	NW. 34-8-22-3	July 2, 1908
Braniff Ditch.....	SE. 30-11-23-3	June 22, 1911
Bridge Creek.....	SE. 33-10-22-3	April 8, 1911
Clark and Thompson Ditch.....	NE. 3-7-21-3	July 19, 1913
A. M. Cross Ditch.....	SE. 5-8-22-3	August 14, 1913
F. Cross Ditch.....	NW. 15-7-22-3	Sept. 9, 1911
Cumberland Ditch.....	SW. 17-11-24-3	June 27, 1914
Davis Creek.....	NE. 29-6-25-3	May 24, 1909
Dimmock Bros. Ditch.....	SE. 16-11-21-3	Sept. 2, 1914
Drury Ditch.....	NW. 19-6-25-3	Sept. 2, 1914
Fairwell Creek.....	NW. 30-6-24-3	June 10, 1909
Fauquier Ditch from Hay Creek.....	NE. 30-10-25-3	June 8, 1914
Fearon Ditch.....	SW. 6-11-24-3	June 25, 1912
Frenchman River.....	NE. 23-6-23-3	October 1911
Frenchman River.....	SE. 31-6-21-3b	July 31, 1908
N. B. Frenchman River.....	NE. 16-7-22-3	July 25, 1908
G. R. Hammond East Ditch.....	SW. 16-10-25-3	May 26, 1915
G. R. Hammond West Ditch.....	SW. 16-10-25-3	May 26, 1915
Hawkin Ditch.....	SE. 26-9-20-3	July 9, 1913
Hay Creek.....	SW. 29-16-25-3	July 4, 1910
Jones Creek.....	SE. 20-8-20-3c	May 15, 1912
Kearney Bros. Ditch.....	SE. 19-8-23-3	Sept. 6, 1913
Lewis Ditch.....	NW. 34-8-22-3	July 29, 1915
Mann Ditch.....	NW. 32-10-22-3	July 1, 1913
McCarthy, Bertram and Salt, East Ditch.....	NW. 29-11-23-3	June 15, 1914
McCarthy, Bertram and Salt, West Ditch.....	NW. 29-11-23-3	June 15, 1914
Moorhead Ditch.....	SE. 25-10-25-3	June 10, 1911
Morrison Bros. Ditch.....	SW. 26-6-21-3	August 22, 1911
Needham Bros. Ditch.....	SW. 30-11-23-3	June 22, 1911
Parker North Ditch.....	SW. 4-9-20-3	July 15, 1913
Parker South Ditch.....	SW. 4-9-20-3	July 15, 1913
Peacock East Ditch.....	SW. 36-10-26-3	May 19, 1915
Peacock West Ditch.....	SW. 36-10-26-3	May 19, 1915
Piapot Creek.....	NE. 18-11-24-3d	June 17, 1908
D. H. Pollock East Ditch.....	NW. 22-7-21-3	August 10, 1911
D. H. Pollock West Ditch.....	NW. 22-7-21-3	August 10, 1911
Sinclair Ditch.....	SE. 18-11-19-3	
Skull Creek.....	SE. 32-10-22-3e	April 8, 1911
C. E. Stearns Ditch.....	NW. 20-8-20-3	July 16, 1913
C. E. Stearns Ditch.....	SW. 20-8-20-3	July 16, 1913
C. E. Stearns Ditch.....	SW. 17-8-20-3	July 16, 1913
Stearns Bros. South Ditch.....	SW. 9-9-20-3	July 21, 1915
Stearns Bros. North Ditch.....	SW. 9-9-20-3	July 21, 1915
Strong Ditch.....	NE. 25-6-22-3f	July 31, 1908

a This station was originally located on the SW. 30-6-25-3, but was moved to its present location on August 2, 1915.

b This station was originally located on the NE. 31-6-21-3, but was moved to its present position on August 21, 1914.

c A station on this stream was previous to 1912 maintained on Sec. 5-8-20-3.

d This station was originally located on the SW. 17-11-24-3, but was moved to its present position on May 13, 1909.

e This station was originally located on the NE. 29-10-22-3, but was moved to its present location on September 1, 1915.

f This station was originally located on Sec. 36-6-22-3, but was moved to its present location on April 17, 1911.

Stream	Location	Date Established
Sucker Creek.....	NW. 24-6-26-3	May 26, 1909
Swiftcurrent Creek.....	SW. 22-7-21-3	May 18, 1909
Swiftcurrent Creek.....	NE. 18-10-19-3	June 15, 1910
Swiftcurrent Creek.....	NW. 17-10-19-3	May 27, 1910
F. T. White Ditch.....	SW. 12-9-22-3	July 25, 1913

Miscellaneous gaugings were made of Blacktail Creek (30-6-23-3), Calf Creek (SE. 5-8-22-3), Concrete Coulee (11-7-23-3), Doyle Coulee (17-7-23-3), Frenchman River (several points), Petrified Coulee (30-6-23-3), Saunders Springs near Maple Creek and several other small springs and streams.

The only winter records obtained in this district were on Saunders Springs.

During 1915 the streams in this district maintained flows which were well above the average.

The early spring flow of streams in this district was obtained by two engineers, M. H. French having charge of the work south, and J. E. Caughey, B.Sc., that north of the Cypress Hills. J. E. Caughey had charge of the field work during the balance of the year. J. E. Caughey, I. R. Strome and G. H. Whyte made the final computations for the annual report.

#### WOOD MOUNTAIN DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Bate Creek.....	NW. 6-6-16-3	April 16, 1914
Bigbreed Creek.....	NW. 3-2-11-3a	March 30, 1914
Bowery Ditch from Rocky Creek.....	{Near Barnard, Montana, U.S.A.}	April 30, 1914
Frenchman River.....	SE. 27-5-16-3	April 10, 1914
Frenchman River.....	NW. 24-1-11-3b	March 29, 1914
Horse Creek.....	{Near Barnard, Montana, U.S.A.}	May 1, 1914
Littlebreed Creek.....	NW. 11-2-11-3	March 31, 1914
McEachran Creek.....	SW. 6-1-7-3	May 1, 1914
Mule Creek.....	SW. 33-5-17-3	April 15, 1914
Rock Creek.....	{Near Barnard, Montana, U.S.A.}	April 30, 1914
Snake Creek.....	SW. 16-4-13-3	April 17, 1914

Winter records were not obtained on any of these streams.

Miscellaneous gaugings were made of several small streams and springs.

Owing to the fact that this district is not very well settled, it is not possible to obtain satisfactory and continuous observations of gauge heights at some of the stations.

F. R. Steinberger, B. E., was in charge of the field work in this district and W. H. Storey, C. H. Giffen and G. H. Whyte made the computations for the annual report.

#### SASKATOON DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Battle River.....	NW. 25-43-17-3c	May 23, 1914
Bridge Creek.....	SE. 23-13-19-3	Mar. 29, 1911
Little Red River.....	SW. 26-49-26-2	July 14, 1915
Long Creek.....	SE. 10-2-8-2	June 22, 1911
Moosejaw Creek.....	NE. 24-11-19-2	June 21, 1911
Moosejaw Creek.....	NW. 16-16-26-2	April 7, 1910
Moose Mountain Creek.....	NE. 15-3-2-2	Sept. 4, 1913
North Saskatchewan River.....	{SW. 33 and NE. 29-43-16- 3}	May 16, 1911
North Saskatchewan River.....	{River Lot No. 76, Prince Albert Settlement}	October 2, 1911
Notukeu Creek.....	NW. 10-11-10-3	August 7, 1914
Qu'Appelle River.....	NW. 33-19-21-2	May 12, 1911
Sandy Creek.....	SE. 29-17-29-2	August 1, 1915
South Saskatchewan River.....	SW. 28-36-5-3	May 27, 1911
Souris River.....	NE. 11-2-8-2	June 23, 1911

a This station was originally located on SE. 15-2-11-3, but was moved to its present location on April 20, 1915.

b This station was originally located on the NW. 3-2-11-3 but was moved to its present location on September 22, 1915, as no observer was available at the upper location.

c A station was previously maintained on this stream on the SE. 19-43-17-3.

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Stream	Location	Date Established
Souris River.....	NE. 36-2-1-2	June 26, 1911
Souris River.....	SW. 6-4-26-1a	July 20, 1911
Spring No. 1.....	NW. 32-12-18-3	April 9, 1915
Spring No. 2.....	NE. 27-12-19-3b	March 13, 1915
Swiftcurrent Creek.....	SW. 12-15-14-3	Jan. 16, 1914
Swiftcurrent Creek.....	NW. 18-15-13-3c	April 30, 1910

Miscellaneous gaugings were made of springs in the vicinity of Gull Lake, Souris River at Weyburn and North Saskatchewan River at LaColle Falls, and of several other streams and springs.

Winter records were obtained on all the regular stations in this district, except Bridge Creek, Moosejaw Creek (NE. 24-11-19-2), Moose Mountain Creek and Souris River (NE. 36-2-1-2). The stations west of Moosejaw were included in Macleod district during the winter period.

The floods on the larger streams in this district during July added much to the office and field work.

F. R. Steinberger, B.E., E. W. W. Hughes and F. K. Beach, A.M. Can. Soc. C.E., were in charge of the field work in this district. The final computations for the report were made by F. K. Beach and I. R. Strome.

## EDMONTON DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Athabaska River.....	SE. 20-66-22-4	Feb. 23, 1913
Battle River.....	SW. 4-43-25-4	May 7, 1913
Clearwater River.....	SE. 16-39-7-5	June 3, 1913
Pigeon Creek.....	SE. 15-46-28-4	August 7, 1914
Red Deer River.....	SE. 20-38-27-4	Dec. 2, 1911
North Saskatchewan River.....	NE. 21-39-7-5	June 2, 1913
North Saskatchewan River.....	{ River Lot No. 17, Edmonton Settlement, NW. 33-52-24-4	{ May 14, 1911
Sturgeon River.....	{ Bet. River Lots 27 and 52, St. Albert Settlement	{ April 23, 1913
Sturgeon River.....	NW. 28-55-22-4	Dec. 30, 1913

Miscellaneous gaugings were made of Blindman River (NW. 15-39-27-4), Brazeau River (19-45-10-5), Buck Creek (SE. 23-47-6-5), Nordegg River (SE. 24-45-10-5), and North Saskatchewan River (26-45-9-5).

All stations in this district were maintained throughout the winter 1914-15, and all but Pigeon Creek and Sturgeon River at St. Albert during the Winter of 1915-16. During the Winter of 1914-15, the stations in this district in the vicinity of Edmonton were included in the Jasper district and those in the south in Calgary winter district. In the winter of 1915-16 the southern streams were again included in the Calgary district, and the northern with the Peace River district.

Floods on these streams in June and July did much damage to private property and also destroyed the cable stations on the North Saskatchewan River, and Clearwater River near Rocky Mountain House. These were re-established in September.

Miscellaneous gaugings in the vicinity of the mouth of Brazeau River were made by H. B. R. Thompson during January and March.

I. R. Strome, B.A.Sc., R. J. McGuinness, P. H. Daniells, B.A.Sc., J. M. Paul, B.A., B.E., and C. M. O'Neil, B.A.Sc., were in charge of the field work in this district for various periods, and I. R. Strome made the final computations for the annual report.

## NORDEGG DISTRICT.

This district included the following regular gauging stations:—

Stream	Location	Date Established
Bighorn River.....	Sec. 18-39-16-5	June 15, 1915
South Branch of Brazeau River.....	Sec. 18-43-16-5	August 27, 1915
Brown Creek.....	Sec. 2-44-17-5	August 28, 1915
Chungo Creek.....	Sec. 13-43-17-5	August 26, 1915

<sup>a</sup> This station was discontinued on July 31, 1915, as the Manitoba Hydrographic Survey established a station at this point.

<sup>b</sup> This station was discontinued on June 29, 1915.

<sup>c</sup> This station was originally located on the SW. 30-15-13-3, but was moved to its present position on May 5, 1913.

Stream	Location	Date Established
Cline River.....	Sec. 7-37-18-5	June 18, 1915
Martin Creek.....	Sec. 27-40-15-5	June 12, 1915
Mistaya River.....	Sec. 33-34-20-5	June 27, 1915
North Saskatchewan River.....	Sec. 23-36-18-5	May 15, 1915
North Saskatchewan River.....	Sec. 14-40-13-5	August 4, 1915
Ram River.....	Sec. 13-39-11-5	August 10, 1915
Shunda Creek.....	Sec. 21-40-13-5	June 1, 1915
Siffleur River.....	Sec. 31-35-17-5	May 17, 1915
Southesk River.....	SW. 6-43-20-5	Sept. 2, 1915
Whiterabbit Creek.....	Sec. 23-36-18-5	May 16, 1915

Miscellaneous measurements were made of Blackstone Creek (SW. 12-42-19-5), South Brazeau River (44-15-5), Brazeau River (39-22-5), Careless Creek (35-18-5), Coral Creek (37-19-5), Corral Creek (37-25-5), George River (NW. 1-42-19-5), Glacier River (34-11-5), Goat Creek (35-18-5), Haven Creek (39-14-5), Mistaya River (32-18-5), Mud Creek (42-16-5), North Saskatchewan River (Brazeau Gap, 33-21-5 and 34-20-5), and a number of other small springs and streams.

Observations of gauge height were made at the regular stations for various periods and throughout the winter on Martin Creek, Shunda Creek and North Saskatchewan River (Sec. 14-40-13-5).

Cables were erected on the North Saskatchewan (two stations), and a temporary cable was used to make measurements on many other streams.

This district was established in 1915 under the charge of O. H. Hoover, B.A.Sc., who installed and maintained the stations as well as carrying out a reconnaissance of the head waters of the North Saskatchewan River. Mr Hoover also made the final computation for the annual report, and a description of the field work and district is given in a report by Mr. Hoover, which will be included in the Appendix to this report.

#### JASPER (ATHABASKA) DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
Athabaska River.....	NW. 15-45-1-6	Mar. 4, 1913
Athabaska River.....	SE. 8-51-25-5	May 4, 1915
Lobstick River.....	NE. 30-53-7-5	July 11, 1913
Maligne River.....	SW. 1-46-1-6	June 17, 1914
McLeod River.....	NW. 3-54-16-5	May 18, 1914
Miette River.....	SW. 9-45-1-6	August 23, 1913
Pembina River.....	SW. 20-53-7-5	Dec. 19, 1913
Rocky River.....	NW. 13-48-28-5	July 3, 1913
North Saskatchewan River.....	NE. 10-49-7-5	June 20, 1915
Sturgeon River.....	SW. 14-54-5-5	April 21, 1914
Sturgeon River.....	SE. 7-55-2-5	April 23, 1914
Sturgeon River.....	NW. 32-54-26-4	April 22, 1914

Miscellaneous gaugings were made of Embarras River (SW. 5-52-18-5), Fiddle Creek (SE. 15-49-27-5), Happy Creek (SE. 14-51-25-5), Hardisty Creek (SE. 24-51-25-5), Maligne River (SW. 33-45-28-5), Prairie Creek (SE. 8-51-25-5), Snaring River (NW. 33-46-1-6), Stony River (NW. 26-48-28-5), Sundance Creek (NW. 3-53-18-5), Wolf Creek (SW. 3-54-16-5), and on several other small streams and springs.

Winter records were obtained on all streams in this district except Sturgeon River (three stations).

Floods prevailed on most of the streams in this district during June, but did not do any great amount of damage.

Continuous gauge height observations cannot be obtained at many of the stations owing to the country being very sparsely settled.

P. H. Daniells, B.Sc., R. J. McGuinness and J. M. Paul, B.A., B.E., were in charge of the field work for various periods and J. M. Paul, A. B. Cook and F. S. Dyke made the final computations for the annual report.

#### PEACE RIVER DISTRICT.

This district included the following regular gauging stations:

Stream	Location	Date Established
North Heart River.....	NW. 27-83-21-5	May 31, 1915
Lesser Slave River.....	SW. 7-73-5-5	May 20, 1915
Peace River.....	NW. 27-83-21-5	May 26, 1915
Peace River.....	SE. 23-108-13-5	August 8, 1915
Smoky River.....	SW. 10-78-24-5	June 4, 1915
Swan River.....	NE. 23-73-10-5	May 19, 1915

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Gauges are also maintained on Lesser Slave Lake, on Sec. 19-75-14-5 and SW. 15-73-6-5.

Miscellaneous gaugings were made of Battle River (96-21-5), Buffalo River (102-20-5), Cadotte River (19-89-21-5), South Heart River (SW. 31-75-16-5), East Prairie River (SW. 11-74-16-5), West Prairie River (SW. 14-74-17-5), Little Smoky River (15-77-14-5), and Whitemud River (25-88-21-5).

This district was started in 1915 and P. H. Daniells, B.Sc., was in charge of the field work, establishing and maintaining stations as well as conducting a reconnaissance of the whole district. Most of the discharge measurements were made from a boat or ferry. A full description of this work and district is given in Mr. Daniells' report for 1915, which will be found in the appendix to this report.

Winter work has been carried out in this district under I. R. Strome and C. M. O'Neil on all streams in this district, except Swan River and Peace River (NW. 18-108-11-5), the latter station being in charge of P. H. Daniells, who is making a special study of the winter flow at that point.

The final computations for the annual report were made by P. H. Daniells, I. R. Strome and O. H. Hoover.

## SPECIAL INVESTIGATIONS.

During 1915, special investigations were made by a party of engineers consisting of R. J. McGuinness, representing the Calgary Office, C. L. Dodge, B.Sc., representing the Department of Natural Resources, Canadian Pacific Railway Company, and L. E. Kendall, B.Sc., representing the Ottawa Office, for the purpose of determining the value of the co-efficient "n" in Kutter's formula for Secondary Canal "A," in the Western Section of the Canadian Pacific Railway Company's Irrigation Block.

Three typical sections of the canal, where no water was diverted, were chosen for these investigations. Each was studied separately, and every care was taken to secure accurate records. The velocities and discharges at each end of each section were determined by frequent current-meter observations and the use of automatic water stage registers. The cross-sections, wetted perimeters, and slopes of the canal were carefully measured with suitable instruments, for several stages of the canal. Descriptions of the canal were also carefully recorded.

These investigations were carried out for several stages of the canal at each section, but owing to the impossibility of filling the canal to its capacity at that time, the results are inconclusive and only a progress report was submitted. Further investigations will therefore have to be made at a later date to complete the work. No report of the results of the investigations was therefore prepared for publication with this report.

After the above work, R. J. McGuinness and L. E. Kendall, with the co-operation of the Department of Natural Resources of the Canadian Pacific Railway Company, continued the study of the absorption losses in the Alberta Railway and Irrigation Company's canals near Lethbridge. By the use of current-meters and automatic water stage registers, continuous records of the flow at each end of the experimental sections were obtained, and the absorption losses in cubic feet for a certain period were determined.

A progress report upon this work was also submitted, but further investigations will be made before a final report is submitted for publication.

## CURRENT-METER RATING STATION.

The engineer in charge of the rating station also had charge of the following regular gauging stations:

Stream	Location	Date Established
Bow River	NE. 15-24-1-5	Nov. 25, 1910
Canadian Pacific Railway Company Canal	NE. 21-23-29-4	May 18, 1911
Elbow River	SW. 14-24-1-5	May 8, 1908
Nose Creek	NW. 13-24-1-5	April 24, 1911

In addition to these stations, gauges were maintained on the Bow River during the open water season, on the SW. 14-24-1-5, NE. 1-24-1-5, SW. 26-23-1-5, and SW. 13-23-1-5, for the Water Power Branch.

Winter records were obtained on the Bow and Elbow Rivers, they being included in the Calgary winter district.

The rating station was operated from April 8 to November 15. During this time seventy-five meters were rated, fifty-six for this branch, nine for the British Columbia Hydrographic Survey, three for the Water Rights branch of British Columbia, four for the Manitoba Hydrographic Survey, one for the Water Power Branch, one for the Canadian Pacific Railway Company and one for the Department of Public Works of Canada.

The field and office work was under the charge of H. M. Nelson.

## DEPARTMENT OF THE INTERIOR

## HYDROMETRIC SURVEYS - 1915 - PLATE NO 2.

GAUGE HEIGHT-DISCHARGE, GAUGE HEIGHT-  
MEAN VELOCITY AND GAUGE HEIGHT-AREA CURVES  
FOR

## BOW RIVER

NEAR

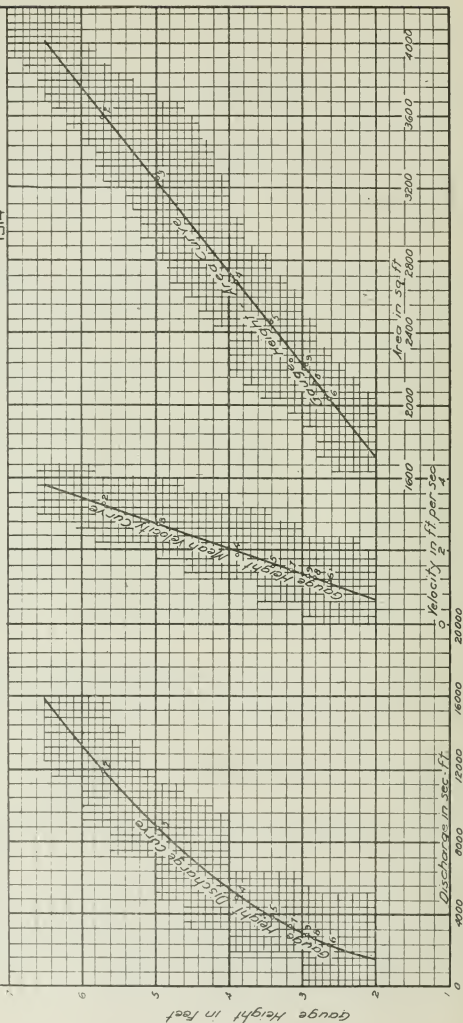
## BASSANO ALBERTA

SE ¼ SEC 2, T 21 R 18 W. OF 4TH MER.

FOR

1914

No	Date	Area	M.Y.	G.H.	Dis.
2	June 7	3537	3.29	5.71	11830
3	" 23	3249	2.69	4.96	8750
4	July 27	2676	1.84	3.90	4902
5	Aug 25	2458	1.57	3.41	3851
6	Sept 15	2035	1.10	2.64	2244
7	Oct 10	2252	1.45	3.16	3278
8	" 28	2119	1.23	2.64	2601
9	Nov 27	2280	1.26	2.94	2802





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## BENCH-MARKS.

When the stream measurement work was first started, the gauges were usually referred to bench-marks on wooden stakes or stumps of trees. These were easily shifted or destroyed and were not satisfactory. In 1911, an iron bench-mark was adopted by this branch, and now almost all the gauges are either referred to bench-marks on concrete piers or other permanent structures, or to one of these iron bench-marks. Whenever an opportunity is afforded these are tied to the Canadian Pacific Railway or Dominion Government levels, to determine their elevation above sea level, and they are therefore also a convenient reference for local levelling operations.

Description of the iron bench-marks are given in the Report of the Progress of Stream Measurements for 1911 and 1912.

## OFFICE WORK.

As above intimated, the reports of the gauge height observers and the engineers are transmitted to the office by mail. These are copied to office forms and filed in a cabinet, which is carefully indexed and where they can be referred to at any time without trouble. As the engineers complete their computations, the results are entered on convenient forms and filed in the same cabinet.

A cabinet made up of four styles of drawers is used for filing the records. The top section is used for filing the gauge height books of the observers and the current-meter notes of the engineers. The gauge height books and current-meter notes are filed alphabetically, according to the names of the streams. The next section contains the postal cards sent in by the observers and these are also filed alphabetically according to the names of the streams. The third section is made up of map drawers and contains the gauge height-area, gauge height-mean velocity and gauge height-discharge curves, and plotted cross-sections, which are filed alphabetically, according to the names of the streams. The same section contains the maps showing the outlines of the drainage basins, filed numerically according to the number of the sectional sheet. The rating curves for the current-meters are also filed in this section numerically, according to the office numbers of the current-meters. The bottom section of the cabinet consists of letter size pockets, alphabetically arranged for each gauging station. The tables of gauge heights, discharge measurements, daily gauge height and discharge, monthly discharge, a description of the station and memoranda of any changes are filed in these pockets. The different rating tables for each meter are also filed numerically in this section and another drawer contains the daily and monthly reports of the meteorological service.

The copying and filing of the reports of the gauge height observers and the engineers is entrusted to the office recorder. While doing this he carefully examines all records to see that there are no errors, and where there are doubtful or impossible records, it is his duty to have the data corrected or ascertain the cause of the unusual condition. He also makes out the pay list for the observers and conducts the correspondence relating to the records.

All computations are checked before being used or published. For this reason, as far as possible, men with some technical education, or students in science, are engaged as helpers. The discharge measurements are computed by the helper and his work is checked by the engineer. In some instances, where there is a great deal of driving and camping out, the engineer cannot secure a helper who can compute discharges, and in that case he computes the discharges himself and his computations are checked in the office.

Gaugings of the flow under ice are usually made by using the multiple point method, and vertical velocity curves have to be plotted to determine the mean velocity in the vertical.

The computation by this method is long and tedious and cannot be done by the engineer in the field. There are, therefore, a great many computations to be made in the office and the services of a computer are required.

G. H. Nettleton, the regular recorder, went on Active Service early in 1915, and W. K. Broughton therefore filled the position of office recorder and J. B. Gray that of office computer, during 1915.

The results of the discharge measurements are plotted on cross-section paper by one of the assistant engineers as soon as they are received in the office, and thus a very close check is kept on the records, and errors can be detected at once and in most cases can be rectified. At the same time the records are kept up to date and demands for provisional estimates can be met at an early date. Important changes in the flow are also detected at once and instructions are issued without delay to the field engineers to obtain further gaugings. The first and second assistants to the Chief Hydrometric Engineer supervise the office and field work by constantly checking and inspecting it and also do considerable work in the preparation of the annual and special reports.

P. M. Sauder, D.L.S., M. Can. Soc. C.E., occupies the position of Chief Hydrometric Engineer, and during 1915, G. H. Whyte and G. R. Elliott, D.L.S., B.A.Sc., A.M. Can. Soc. C.E., were respectively the first and second assistants to the Chief Hydrometric Engineer. In August Mr. Elliott went on Active Service, as a Lieutenant in the Divisional Cyclists. He was not replaced, but on January 1, 1916, G. H. Whyte and N. M. Sutherland were appointed Divisional Hydrometric Engineers, and had charge of the preparation of most of the records for this report.

## FUTURE WORK.

During 1916, a special effort is being made to again obtain the total spring run-off of the main streams in the Cypress Hills and of Pakowki Lake drainage basin. The records obtained in former years on these streams are of especial value and no doubt those of 1916 will be just as valuable.

While the districts will be re-arranged and a few unimportant stations discontinued, practically all the regular work will be continued during 1916.

The investigations of absorption losses in irrigation canals will also be continued.

Parties will again be placed on the headwaters of the North Saskatchewan River and in the Peace River district. In both these districts there are water power sites, and records of the flow are required to determine the possibilities. Ordinary transportation facilities are not available in either district. The engineer on the headwaters of the North Saskatchewan River will therefore have to use pack ponies and the one in Peace River district will probably use boats or canoes.

## DEFINITIONS.

The volume of water flowing in a stream is known as run-off or discharge. In expressing it various units are used, depending upon the kind of work for which the data is needed. Those used in this report are "second-foot," "acre-foot," "run-off per square mile" and "run-off in depth in inches" and may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the body of water flowing in a stream one foot wide and one foot deep at the rate of one foot per second.

The "acre-foot" is the unit capacity used in connection with storage for irrigation work and is equivalent to 43,560 cubic feet. It is the quantity required to cover an acre to a depth of one foot.

The expression "second-feet per square mile" means the average number of cubic feet of water flowing each second from every square mile of drainage area on the assumption that the run-off is uniformly distributed.

"Depth in inches" means the depth of water in inches that would have covered the drainage area, uniformly distributed, if all the water could have accumulated on the surface. This quantity is used for comparing run-off with rainfall, which quantity is usually given in depth in inches.

It should be noticed that "acre-feet" and "depth in inches" represent the actual quantities of water which are produced during the periods in question, while "second-feet," on the contrary, is merely a rate of flow per second.

## EXPLANATION AND USE OF TABLES.

The data obtained and the estimates made therefrom have been compiled in tabulated form and for each regular gauging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Table of daily gauge heights and discharges.
4. Table of monthly discharges and run-off.

The description of stations gives such general information about the locality and equipment as would enable the reader to find and use the station. It also gives, as far as possible, complete history of all the changes that have occurred since the station was established and that might affect the records in any way.

The list of discharge measurements gives the results of all the discharge measurements that have been made at or in the vicinity of the gauging station, or have been used in completing the records for the gauging station. It gives the date on which the measurement was made, the name of the engineer, the width and area of cross-section, the mean velocity of the current, the gauge height and the discharge in second-feet.

The table of daily gauge heights and discharges given in this report is a combination of two tables kept in the office of the survey, namely the table of daily gauge heights and the station rating table. The table of daily gauge heights gives the daily fluctuations of the surface of the water above the zero of the gauge, as reported by the observer. During high water, two observations of the gauge were made at some stations and the gauge height given in the table is the mean of the observations for the day. Where automatic gauges are maintained the records given are the mean stage for the day. The discharge measurements and gauge heights are the base data from which the other tables are computed. The table of daily discharges is the discharge in second-feet, corresponding to the stage of the stream, as given by the station rating table.

In the table of monthly discharge the column headed "maximum" gives the mean flow for the day when the mean gauge height was highest. As the gauge height is the mean for the day, there might have been short periods when the water level and the corresponding discharge were higher than given in this column. Likewise, in the column "minimum" the quantity given is the mean flow for the day when the mean gauge height was lowest. The column headed "mean"



## SESSIONAL PAPER No. 25c

is the average flow for each second during the month. The computations for the quantities in the remaining columns have been based upon this mean. The drainage area for each gauging station was marked off on the sectional maps of the department and the area taken off with a planimeter. In many districts, information regarding topographical features is very incomplete and the computed areas are only approximate. As the surveys of the department are extended and completed, these computations will be checked and, if necessary, corrected.

## CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:—

- 1 cubic foot equals 6.23 British Imperial gallons.
- 1 cubic foot equals 7.48 United States gallons.
- 1 acre equals 43,560 square feet; equals 4,840 square yards.
- 1 acre-foot equals 43,560 cubic feet.
- 1 acre-foot equals 271,472 British Imperial gallons.
- 1 acre-foot equals 325,850 United States gallons.
- 1 inch deep on 1 square mile equals 2,323,200 cubic feet.
- 1 inch deep on 1 square mile equals 0.0737 second-foot per year.
- 1 second-foot equals 6.23 British Imperial gallons per second; equals 373.8 gallons per minute; equals 538,272 gallons for one day.
- 1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
- 1 second-foot equals about 1 acre-inch per hour.
- 1 second-foot for one day equals 1.983 acre-feet.
- 1 second-foot for one 28-day month equals 55.54 acre-feet.
- 1 second-foot for one 29-day month equals 57.52 acre-feet.
- 1 second-foot for one 30-day month equals 59.50 acre-feet.
- 1 second-foot for one 31-day month equals 61.49 acre-feet.
- 1 second-foot for 153 days equals 303.47 acre-feet.
- 1 second-foot for one year equals 724 acre-feet.
- 1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
- 1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
- 1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
- 1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
- 1 second-foot for 153 days covers 150 acres 24,278 inches or 2.023 feet deep.
- 1 second-foot for one year covers 1 square mile 13,572 inches or 1.131 feet deep.
- 100 British Imperial gallons per minute equals 0.268 second-foot.
- 100 United States gallons per minute equals 0.223 second-foot.
- 1,000,000 British Imperial gallons per day equals 1.86 second-foot.
- 1,000,000 United States gallons per day equals 1.55 second-foot.
- 1,000,000 British Imperial gallons equals 3.68 acre-feet.
- 1,000,000 United States gallons equals 3.07 acre-feet.
- 1,000,000 cubic feet equals 22.95 acre-feet.
- 1 foot per second equals 0.682 miles per hour.
- 1 cubic foot of water weighs 62.5 pounds.
- 1 horse-power equals 550 foot-pounds per second.
- 1 horse-power equals 746 watts.
- 1 horse-power equals 1 second-foot falling 8.80 feet.
- 1½ horse power equals 1 kilowatt.
- 1 British Columbia miner's inch equals 1.68 cubic feet per minute, or 1 second-foot approximately equals 35.7 British Columbia miner's inches.

To calculate water power quickly:  $\frac{\text{sec. ft. x fall in feet}}{11} = \frac{\text{net horsepower on water wheel, realizing } 80 \text{ per cent of the theoretical power.}}{}$

To find the number of acre-feet required for a certain acreage under the prescribed duty of water of one hundred and fifty acres for each cubic foot of water per second flowing continuously during the irrigation season (153 days), multiply the acreage by 2.02314.

## METHODS OF MEASURING STREAM FLOW.

There are three distinct methods of determining the surface flow of streams: (1) by measurements of slope and cross-section and the use of Chezy's and Kutter's formulae; (2) by means of weirs, which include any device or structure that by measuring the depth on a crest or sill of known length and form, the flow of water may be determined; (3) by measuring the velocity of the current and the cross-section. The third method is the one most commonly used by this survey. The second is used when the flow is too small to be accurately determined by the third, while the first is only used in making estimates of the discharge of a stream when the only data available are the cross-section and slope.

DEPARTMENT OF THE INTERIOR

HYDROMETRIC SURVEYS - 1915 - PLATE NO 3.

DIAGRAM SHOWING THE EFFECT OF AN ICE COVER ON THE  
RELATION BETWEEN THE GAUGE HEIGHTS AND DISCHARGES

## ST. MARY RIVER

AT

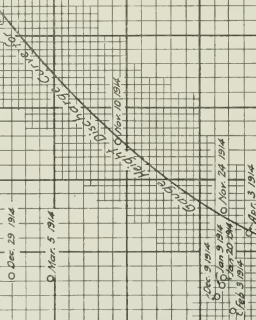
WHITNEY'S RANCH

NE 1/4 SEC. 26, T. 7, R. 22, W. OF 4TH MER.  
FOR  
1915

Gauge Height in Feet

Discharge in second Feet

THE RIVER CLEARED OF ICE ABOUT THE MIDDLE OF MARCH AND BECAME FROZEN OVER AGAIN ABOUT THE END OF NOVEMBER. THE GAUGE HEIGHT DISCHARGE CURVE IS BASED ON THE GAUGINGS MADE DURING THE OPEN WATER PERIOD IN 1914 AND IS WELL DEFINED. THE PLOTTED MEASUREMENTS ALSO SHOW HOW IMPOSSIBLE IT IS TO DRAW A RATING CURVE WHEN ICE CONDITIONS PREVAIL.



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**SLOPE METHOD OF DETERMINING DISCHARGE.**—The slope of a stream, or rather of a section of a stream, is the difference in elevation between the upper and lower ends of the section, commonly called the fall, divided by the distance or the length of the section. Slope sections vary in length from a few hundred feet to several thousand feet, depending largely upon the nature of the stream.

It is difficult to ascertain accurately the slope of the water surface in a stream, since in nearly all streams there are pulsations in the water, causing the surface to rise and fall locally. In most streams the slope of the bottom is far from uniform, and the flow of water in any given section is more or less influenced by the flow in the adjacent section, above or below. For this reason it is a good plan to consider a number of adjacent sections, comprising a considerable length of the stream in one computation, being careful to take into account the diversity of cross-section at various places in the length, and the fact that the slope of the water surface of a stream becomes more uniform during high water and flood stages.

In determining the slope of the surface of a stream, levels are taken of the water surface at each end of the slope section, and referred to some datum or bench-mark. A good plan is to set firmly a stout wooden stake below the water surface at each end of the slope section, and then to drive a nail into the top of each stake, so that the nail-head will exactly coincide with the water surface. The difference in elevation between the two nail-heads, divided by the distance between the stakes, will give the slope.

The wetted perimeter is that portion of a stream channel that is in contact with the water. The form or outline of the wetted perimeter of a stream has an important influence upon the velocity of the current. It is usually determined graphically from the plotted cross-section or may be measured by means of a flexible tape or chain after the flood has subsided.

The hydraulic radius, which is sometimes called the mean radius of the channel below the water surface is found by dividing the area of the cross-section (in sq. ft.) by the length of the wetted perimeter (in feet).

The Chezy formula, which is the fundamental formula for stream discharge, is:

$$Q = AV$$

in which  $Q$  = the discharge of the stream in sec.-ft.  
 $A$  = the area of the cross-section in sq. feet.  
 $V$  = the mean velocity of flow, in ft. per sec.

In applying this formula to the determination of stream discharge, the mean velocity of a stream is considered a function of the slope and of the wetted perimeter of the stream. This may be expressed by formula as follows:

$$V = C \sqrt{rs}$$

in which  $r$  = the hydraulic radius of the channel.  
 $s$  = the surface slope.

and  $C$  is a variable coefficient, depending upon the nature of the channel. In determining the value of  $C$  for any given case it is customary to make use of Kutter's formula, which is:

$$C = \frac{41.6 + \frac{.00281}{s} + \frac{1.811}{n}}{1 + \left\{ 41.6 + \frac{.00281}{s} \right\} \sqrt{\frac{n}{r}}}$$

In this formula  $r$  and  $s$  have the same significance as in the Chezy formula and the new factor  $n$  is called the coefficient of roughness. It is a variable coefficient, and its value is dependent upon the size, shape, slope and degree of roughness of the channel. Tables of values of  $n$  are given in various text books, but it is difficult to choose the correct value. It is therefore advisable, whenever possible, to compute the value of  $n$  from a measured discharge. As the slope method of determining discharge is seldom employed except to estimate flood discharge, a current meter measurement is very often made at the slope section, during low water. Having determined the mean velocity, slope and hydraulic radius at the time of the metering,

the value of  $C$  may be found from the formula  $V = C \sqrt{rs}$  or  $C = \frac{V}{\sqrt{rs}}$ . Trautwine's Pocket Book for Civil Engineers and other texts contain tables giving the value of  $n$  for different values of  $r$ ,  $s$ , and  $c$ . From these tables we can interpolate the proper value of  $n$  for a particular section of the stream, at low water stage. In most cases this value of  $n$  is applicable to high water and flood conditions of the stream also, and is used with values of  $r$  and  $s$  for the high water or flood cross-section to determine the value of  $C$  at the higher stage. Having determined the value of  $C$  the computation of the discharge is simple.

The results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value of  $n$  to be used.

**WEIR METHOD OF DETERMINING DISCHARGE.**—As yet few permanent weirs have been constructed by this survey, but many regular weir measurements are made on small streams by means of a temporary weir. The weir used consists of a wooden base of 2-inch plank, to which is bolted a rectangular notch of three-eighths inch steel with bevelled edges.

In making a measurement by means of a temporary weir, the following directions should be followed as far as possible. The weir should be placed perpendicular and at right angles to

the bed of the stream with the crest level. The discharge should be free in so much as the nappe should have sufficient fall to allow air to have free circulation underneath it, and the head or depth on the crest should not exceed one-third of the length. The channel of approach should be several times as wide as the opening and the depth of water in the bay or pond should be at least twice the head on the weir, so as to eliminate velocity of approach and cross-currents. In choosing a site for a weir, a point should be chosen that will fulfil the above conditions and give a good-sized bay or pond.

To set up a temporary weir, a dam of sods and earth is thrown across the stream, the weir is set in place and the sods are tramped firmly around it to stop all leakage. On a stream with a sandy bed, sods or clay must be placed on the bottom for a few feet upstream to form a mattress to prevent the undermining of the dam.

After the bay has filled up, the head of the water is observed by taking the difference in elevation of the crest of the weir and the elevation of the water surface in the bay at a distance of 4 to 10 feet from the weir, with an engineer's level. Two common methods of getting the elevation of the water surface are: (1) hold the levelling rod on a stone or other solid body under water and subtract the depth of water on the rod from the sight on the rod; (2) drive a pin divided into tenths of feet into the bed of the stream so that an even tenth is level with the surface of the water, then hold the levelling rod on the top of the pin and add the length of pin above the water to the sight on the rod.

When the head of water has been determined, the discharge is computed by using one of the standard formulae which will suit the case. Tables giving the discharges for different heads and lengths of crests are published in many engineering texts.

The formula used by this survey for rectangular sharp-crested weirs is:

$$Q = 3.33 (L - .2H) H^{3/2} \text{ being a modification of Francis' formula, to allow for end contractions and elimination of velocity of approach.}$$

in which  $Q$  = discharge in sec.-ft.;  $L$  = length of crest in feet;  $H$  = head in feet.

Measurements by means of temporary weirs should be made some distance above or below the gauge. If they are made close to a gauge, the gauge must be read before the weir is placed in the stream, and the pond must be allowed to run off after the weir is removed before the gauge is re-read.

Where permanent weirs are installed, the gauge height observed is that of an auxiliary gauge above the weir, which is kept so that the head of the weir can be read direct. The weir is not usually placed so that it will interfere with the regular station, so that if at any time the weir is destroyed the regular gauge can be read during the period that the weir is out of order.

**VELOCITY METHOD OF DETERMINING DISCHARGE.**—There are two methods of determining the velocity of flow of a stream, namely, direct and indirect. In the direct method, by which the velocity is determined by means of floats, the liability of error is large, and the results far from satisfactory. This method is seldom used except for very rough estimates, or when a current meter cannot be used. There are three common kinds of floats, viz.: surface, sub-surface and tube or rod floats. In each the procedure is the same. A straight piece of channel is selected for the run and two cross-sections are taken at some convenient distance apart, usually from 100 to 200 feet. They are then divided into strips by means of a tagged wire. The velocity in each strip is then measured by noting the time taken by the float in traversing the run or distance between the two cross-sections. As the time and distance are both known the velocity can easily be computed. The velocity, whether measured by surface, sub-surface or tube floats, must be multiplied by a coefficient less than unity to reduce to the mean velocity before being used to compute the discharge.

The indirect or current-meter method is the most reliable and most widely used method of determining the velocity of the flow of a stream. The meter used by this survey is the Price Patent, manufactured by W. & L. E. Gurley, Troy, N.Y. It consists of six cups attached to a vertical shaft, which revolves on a conical hardened steel point when immersed in moving water. The number of revolutions is indicated electrically. The rating or relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter by drawing it through still water for a given distance at different speeds and noting the number of revolutions for each run. From this data a rating table is prepared which gives the velocity per second of moving water for any number of revolutions in a given time interval.

In making a measurement with a current meter, a number of points, called measuring points, are measured off above and in the plane of the measuring section, at which observations of depth and velocity are taken. These points are spaced equally for those parts of the section where the flow is uniform and smooth, but should be spaced unequally for other parts according to the discretion and judgment of the engineer. In general, the points should not be spaced farther apart than 5 per cent of the distance between piers, nor farther apart than the approximate mean depth of the section at the time of measurement.

The measuring points divide the total cross-section into elementary strips, at each end of which observations of depth and velocity are made. The discharge of any elementary strip is the product of the average of the depths at the ends, the width of the strip, and the average of the mean velocities at two ends of the strip. The sum of the discharges of the elementary strips is the total discharge of the stream.

The accuracy of a discharge measurement taken at a velocity area station is dependent on two factors, the accuracy with which the area of the cross-section and the mean velocity of

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the flow normal to that section are measured. The greatest, and the most common errors in measurements of discharge are caused by erroneous soundings. Errors in soundings by weight and line are due to the weight being carried down-stream, or, sometimes to the bowing of the line. Both these causes make the soundings too great. Errors in soundings with rods are due to the rod not being perpendicular, to the water rising on the rod, and to the rod sinking in the bed. In order to verify the accuracy of soundings made at medium or high stages they should be compared with those at low water. The mean velocity is also very difficult to measure accurately, because it is constantly changing. It varies not only from the surface to the bottom, but from one bank of the stream to the other, making it necessary to measure it at a number of points.

## METHODS OF DETERMINING MEAN VELOCITY.

There are a number of different methods of determining the mean velocity at the ends of these strips, or, as it is commonly called, the mean velocity in a vertical, namely, multiple-point, single-point, and integration. These three principal multiple-point methods in general use are the vertical velocity-curve, three-point and two-point method.

**VERTICAL VELOCITY-CURVE METHOD OF DETERMINING MEAN VELOCITY.**—In this method the centre of the meter is held as close to the surface of the water as possible, being careful to keep it out of reach of all surface disturbances, and then at a number of different depths throughout the vertical. The velocity at each position of the meter is recorded. These observations are then plotted with velocities in feet per second as abscissae and their corresponding depths in feet as ordinates, and a mean curve is drawn through the points. The mean velocity for the vertical is obtained by dividing the area bounded by the curve and its axis by the depth. In the absence of a planimeter for measuring the area, the depth is divided into 5 to 10 equal parts, and the velocities of the centre ordinates of these parts are noted. The mean of these velocities will very closely approximate the mean in the vertical.

It is often more convenient, when the depth is a number of feet and a fraction, as 7.4, to divide the depth into 7 parts of a foot width, and a part of 0.4 foot width. Then the velocity to enter for the narrow part is 0.4 of the velocity at the centre of it.

The vertical velocity curve is useful in studying the manner in which velocities occur in a vertical. From a study of a number of these curves the other shorter methods of determining mean velocity are deduced. On account of the length of time taken to complete a measurement, this method is not used in general routine measurements, except during the winter, for a change of stage is almost sure to occur during a measurement on a large stream which counterbalances the increased accuracy. For this reason its use is limited to the determination of the coefficient to be used in the reduction of values obtained by other methods of measuring velocity to the true value, to the measurements of velocities under new and unusual conditions of flow, and for measurements under ice.

**THREE-POINT METHOD OF DETERMINING MEAN VELOCITY.**—This method is one of the short methods of obtaining the mean velocity in the vertical and, under some conditions, gives the most accurate results next to the vertical velocity-curve method. It has been used almost exclusively by this survey in past years, during the open water period, but recently has been superseded by the two-point method which, under most conditions, gives more accurate results. In the three-point method, the current-meter is held at 0.2, 0.6, and 0.8 depth. The mean is then obtained by dividing by 4 the sum of the velocities at 0.2 and 0.8 depth plus twice the velocity at 0.6 depth.

**TWO-POINT METHOD OF DETERMINING MEAN VELOCITY.**—In studying the vertical curves made at a number of different points and under varied conditions, it has been found that the mean of the velocities occurring at 0.2 and 0.8 depth gives very nearly the mean velocity in the vertical. Use is made of this fact in the two-point method of determining mean velocity, the meter being held at 0.2 and 0.8 depth in the vertical. This method has been found more accurate than the single-point method and the time required for a metering is not very much greater. This method has been found to give, also, a very close approximate to the mean velocity in measurements of ice-covered streams, although these flow under very different conditions from those of open water.

**SINGLE-POINT METHOD OF DETERMINING MEAN VELOCITY.**—Experiments made under most favourable conditions and extending over a long period have established the point of mean velocity in a vertical at 0.6 of the depth. Therefore the error resulting from the use of the 0.6 depth as the depth of mean velocity is very small, though in some few cases a study of the vertical velocity curve will show the need of a coefficient to reduce the observed velocities to the mean. The variation of the coefficient from unity in individual cases is, however, greater than in the two or three-point method, and the general results are not as satisfactory. For that reason this method is not employed very extensively by the survey.

In the other principal single-point method the meter is held near the surface, at from 0.5 to 1 foot below the surface, care being taken to sink the instrument below the influence of wind or waves. The resulting velocities must be multiplied by a coefficient to reduce them to mean velocities. This coefficient as found by a large number of experiments, varies from 0.78 to 0.98, depending upon the depth and speed of the stream. The deeper the stream and the



greater the velocity, the larger the coefficient. In flood work coefficients varying from 0.90 to 0.95 should be used. This method is only used when the current is too strong to permit the sinking of the meter to any great depth below the surface of the water. It is often employed at time of flood, or when a stream is carrying a lot of drift-wood or ice.

**INTEGRATION METHOD OF DETERMINING MEAN VELOCITY.**—This method of determining the mean velocity in a vertical consists in moving the meter at a slow uniform speed from the bed of the stream to the surface and return in a vertical direction, the time and revolutions being observed. In travelling through all parts of the vertical the meter is acted upon by each and every thread of velocity from the bed to the surface of the stream, and the resulting observations determine the mean in that vertical.

This method is very useful in checking the results of other methods. It is, however, seldom used by this survey, as the Price meter is not suited to observations by this method, since the vertical motion of the meter causes the wheel to revolve.

#### GAUGING STATIONS.

The first step is to select a suitable locality for a gauging station. Although apparently simple, this is really a difficult task. Not only must the water be moving in nearly straight lines over a solid bed and between well defined banks, but the place must be accessible at moderate cost and there must be living near it a competent person who can be engaged to serve as observer. Permanent gauging stations should only be selected after a very thorough reconnaissance. In the irrigation districts and in more thickly populated districts there is more or less diversion of water. This is apt to complicate matters for the engineer, for a gauging station above all works may not include all the tributaries of the stream and it is often necessary to establish gauging stations at several points along the streams, and on tributaries, canals, and pipe lines in order to obtain complete information regarding the water supply in a particular stream.

There are three classes of gauging stations, namely, wading, bridge and cable stations. The wading station can of course only be used in the case of small streams having a maximum depth at its highest stage of three feet or less. The equipment for a wading station is small, consisting usually of a plain staff gauge, graduated to feet and hundredths, and fixed vertically to one of the banks of the stream. For convenience a measuring line, usually a wire with tags, may be fixed permanently at this section. When taking the reading, the engineer should stand below and to one side of the meter so as not to cause eddies in the water.

Bridge stations, because of their permanency and the freedom of movement allowed the engineer, are much preferred. Very often, however, more particularly in swift currents, the piers materially affect the accuracy of the results. When the gauge cannot be attached to a pier it is often attached horizontally to the guard-rail or floor of the bridge, and the height of the stream is found by lowering a weight by a chain over a pulley. It is indicated by a marker on the chain. Distances of three, five or ten feet, according to the size of the stream, are marked on the lower chord of the down stream side of the bridge, to serve as a measuring line.

Frequently it is impossible to establish a permanent gauging station at a bridge. In that case the wire cable of a ferry can be utilized, or, if that is not available, a permanent wire cable is stretched across the river. For spans of average length a galvanized wire cable three-fourths of an inch in diameter is safe. It is supported at each bank by means of high struts or by passing it through the crotch of a tree. The cable is run into the ground and anchored securely to a "dead man" buried at least six feet below the surface, or, if convenient, it is anchored to a lower part of the trunk of a tree. A turnbuckle is inserted in the cable between the strut and anchorage to permit tightening the cable when it begins to sag. A permanent measuring line, usually a wire, with tags five or ten feet apart, is stretched across the stream just above the cable. A cage large enough to carry two men and instruments is constructed and suspended from the cable by means of cast iron pulleys. The cage is moved from point to point by hand. A stay line, usually quarter inch guy wire, is stretched across the stream about thirty to forty feet upstream from the cable, and securely fastened. By passing a sash cord through a pulley hung on this stay line the current-meter is prevented from being carried down stream. This type of station has the advantage that it can usually be located at the most desirable point on the stream and is free of piers and other obstructions.

#### LOW VELOCITY LIMITATIONS.

Owing to the presence of a slight amount of friction in the current-meter, a certain definite velocity is required to make the wheel revolve, i.e., to overcome the frictional resistance of the wheel. For this reason the meter is unsuitable for the measurement of low velocities approaching this value. This velocity, which is required to overcome friction, and which is obtained from the meter rating curve, is called the velocity of no flow for the particular meter referred to. It varies in different types of meters, and also slightly in meters of the same type, according to the time the meter is in use, but very seldom exceeds 0.2 foot per second in any meter. From a number of observations the low velocity limit, below which values of velocity are unreliable, is found to be 0.5 foot per second. In many cases at low stages the gauging station on a stream becomes unsuitable for a discharge measurement owing

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to the mean velocity in the section falling below the safe limit. In such instances, where it is possible to wade the stream, a suitable gauging section may be located within a reasonable distance of the regular station and the discharge measurements made at this point. When a gauging is made at a cross-section other than the regular station, sufficient soundings should be made at the latter at the time of the gauging to develop the cross-section and compute the area. The measurement is thus referred to the regular gauging station, and the mean velocity and area at the regular section are reported and used in the office computations.

## OFFICE COMPUTATIONS.

**RATING CURVES AND TABLES.**—When a series of discharge measurements has been made at a gauging station a rating curve is constructed for that station, showing graphically the discharge corresponding to any stage of the stream within the limits covered by the gaugings. This curve, as it is usually drawn, has as abscissae the discharges in second-feet, and as ordinates the corresponding gauge heights at which the discharges were made. A smooth curve is drawn through the resulting set of points, and from this curve the discharges at any stage within the limits of the curve are taken. Some measurements may be more reliable than others, owing to more or less favourable conditions at different times of gauging, or to other causes. In order to obtain the weight of the different measurements, curves with area and mean velocity, as abscissae, and gauge heights as ordinates, are also drawn. From a study of these curves any discrepancies in a measurement, either in its area or mean velocity, may be detected. Should it be necessary to extend the rating curve beyond the limits of actual discharge measurements, the area and mean velocity curves may be constructed to the stages for which the discharge curve is desired, and the latter found by taking the product of the two curves. The discharge curve under natural conditions of flow is always convex to the gauge height axis. The area curve is either a straight line or is convex to the gauge height axis, except in the case of overhanging banks, when it becomes concave to the axis. The mean velocity curve is always concave to the gauge height axis, except in cases where standing water occurs below the stage of no-flow. In this case the curve will assume a reverse form, starting from the gauge height of zero-flow with a curve convex to the gauge height axis and gradually reversing to a curve concave to this axis. In plotting all three curves the horizontal and vertical scales should be chosen that the curves may be used within the limits of accuracy for the work, and in their critical position will make, as nearly as possible, angles of 45 degrees with each axis.

The rating curve being constructed, it becomes necessary to prepare a station rating table, giving the discharge at any stage of the stream within the limits of the daily gauge height observations on record. From this rating table the daily discharges corresponding to the daily gauge heights are read and tabulated. The rating table is constructed for tenths, half-tenths, or hundredths of feet, according to the readings of the gauge to which it is to be applied. The discharges for this table are read directly from the rating curve and are then adjusted so that the differences for successive stages shall be either constant or gradually increasing, but never decreasing, unless the station is affected by backwater.

**DAILY DISCHARGE, MONTHLY MEAN, AND RUN-OFF.**—The rating table being made to cover the range of daily gauge height observations, the next procedure in the computations is to make out a table of daily discharges from this rating table. The daily gauge heights are copied as they were sent in by the observer, and opposite each the corresponding discharge is filled in from the rating table. The monthly discharge is found by totalling the daily discharges for the month in question, and the monthly mean is obtained by dividing this total by the number of days in the month.

The run-off is computed with two different sets of units, depending upon the kind of work for which the data is intended, as follows:

(1) Run-off in inches is the depth to which a plane surface equal in extent to the drainage area would be covered if all the water flowing from it in a given time were conserved and uniformly distributed thereon; it is used for comparing run-off with rainfall, which is usually expressed in depth in inches. The monthly mean run-off in second-feet is divided by the area of the drainage basin in square miles to find the monthly mean run-off per square mile. This result, reduced to run-off in depth in inches for the monthly period, is in the form required.

(2) The run-off in acre-feet is the form of most use in connection with storage. An acre-foot is equivalent to 43,560 cubic feet, and is the quantity of water required to cover an acre to the depth of one foot. The monthly mean run-off in second-feet is used for the computation of run-off in acre-feet. The monthly mean is reduced to cubic feet per month, and this quantity divided by 43,560 gives the run-off in acre-feet.

The run-off of the stream being computed both in depth in inches and in acre-feet for each month, the run-off for the period during which observations of run-off were made is found by the summation of the amounts of run-off for the several months making up this period.

**CHANGING CONDITIONS OF CHANNEL.**—On streams such as Milk River, whose bed is in a constant state of motion, measurements of discharge should be made every few days, otherwise considerable data relating to changes cannot be obtained. For discharges on days other than those on which measurements are taken, the interpolation method is used. The two methods of interpolation in general use are the Stout and Bolster methods.



OBSERVATIONS OF GAUGE HEIGHTS ON ST. MARY RIVER AT WHITNEY'S RANCH WITH CORRESPONDING MAXIMUM AND MINIMUM TEMPERATURES AND THE ESTIMATED DAILY DISCHARGES FOR THE WINTER 1913-1914

The circles on the discharge graph indicate actual discharge measurements



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The Stout method deals with the correction of the gauge heights. A curve is drawn, using the difference between the actual gauge heights at the time of measurement and the gauge height corresponding to the measured discharge as ordinates, and the corresponding days of the month as abscissae. From an irregular curve drawn through these points corrections for gauge heights can be made for days on which there was no discharge measurement. When the discharge is greater than that given by the curve the correction is positive, and vice-versa. Each daily gauge height is corrected by the amount shown on the correction curve, and the corresponding discharge taken from an approximate rating curve for the station.

The Bolster method deals more particularly with the modification of the discharge. Results of discharge measurements covering a whole year or season are plotted and, though considerably scattered, will define one or more regular curves, called standard curves, the number and position of each indicating the radical changes. Where the river bed changes from day to day, the position of the standard curve also varies and must pass through the points indicating the different days. The points indicating two successive measurements are joined by a line, which for short distances on the cross-section paper is a straight line, and otherwise a curve. This line is divided into a number of equal parts, each indicating an intervening day, the assumption being that as the change during this period is gradual the daily rating must pass through each point or day, as represented by the divisions. A simple and convenient way of making these interpolations and moving the daily rating curve is to make a tracing of the standard curve with a vertical line of reference. By keeping the lines of reference coincident, this curve can be shifted into any desired position and the discharge read for any gauge height.

## WINTER RECORDS.

**FORMATION OF ICE AND ICE CONDITIONS.**—Perhaps the greatest difficulties in stream measurements are met with in the early part of the winter, just as the streams are commencing to freeze up. Especially is this true in the swift running streams in or near the mountains. Needle and anchor ice often form in large quantities in rapids and, flowing in masses with the water, make gaugings very difficult and unreliable. Even after a permanent ice cover is obtained at the gauging station this ice will, in some cases, obstruct the channel below the station and cause "backwater."

A further difficulty is that the surface ice usually forms along the edges of the stream for some time before forming in the centre of the channel. At first this may be broken away if the stream is small and open water measurement made, but later it is necessary to take some observations through holes in the ice along the edge. As the streams get farther away from the mountains their velocity decreases, and fewer rapids occur along their course. There is then less trouble with needle and anchor ice, and a permanent ice cover forms much more quickly.

In many cases the section used during the summer is very unsuitable for making measurements during the winter. It may be (a) too wide and shallow or flowing in two channels during the winter, due to low water; (b) partially open, due to swift running water or warm water running in; (c) affected by needle and anchor ice, either by flowing in the water, or causing backwater; (d) located where the snow drifts over the ice to a great depth; (e) that it is likely to have a rough ice cover or pile up with ice, due to swift water and a rough bed; (f) that there is a tendency for ice jams to occur, with consequent backwater, etc.

It is therefore often necessary to choose a new section for winter observations. This should be done before freeze-up, for then the width, depth, uniformity of flow and conditions above and below can be easily noted. The most suitable stations for winter measurements are those which have a long stretch of very smooth, sluggish water above, and a rapid fall below.

**DISCHARGE MEASUREMENTS.**—In winter as in summer, the daily discharges of a stream are computed from frequent discharge measurements, and daily gauge height observations. The discharge measurements are made through holes in the ice from five to ten or even twenty feet apart, depending upon the size of the stream, and large enough to allow the current-meter to pass through freely. The gaugings are made in the same manner as at open sections except that the depth of the stream is taken as the distance from the bottom of the ice to the bed of the stream. The soundings, however, are always referred to the surface of the water in the holes, the distance from the surface of the water to the bottom of the ice being measured and subtracted from the soundings to obtain the depth.

The vertical velocity curve method is usually used for the determination of the mean velocity in the vertical. A curve is plotted for each vertical, and the mean velocity is determined in the usual manner. These curves vary greatly as to form for different kinds and conditions of channel.

The typical curve, however, differs from that obtained from an open water observation in that it is drawn back more at the surface, owing no doubt to greater friction between the ice and the water as compared with the water and the atmosphere. As a result there are two points in the vertical at which the thread of mean velocity occurs under an ice cover. These points are near 0.2 and 0.8 of the total depth below the bottom of the ice, and the mean of the

velocities at these two depths will give accurate results, but when close estimates of the discharges are required, and the conditions are not very favourable, the vertical velocity method should be used.

It is found that when all the holes are opened on a small swift stream, there are sometimes vertical pulsations of the water in the holes, which affect the velocity readings. This can usually be avoided by only opening one hole at a time, and filling it in again with ice and snow as soon as the observation is finished. It can also be overcome by inserting a thin sheet of galvanized tin or iron at the bottom of the hole after the meter has been lowered into the water. The meter should always be held near the upstream side of the hole.

In using the meter care must be taken to keep it under the water as much as possible to prevent ice from forming around the bearings. It is a good plan to clean and oil the meter indoors before starting out to make a gauging.

**GAUGES AND GAUGE OBSERVATIONS.**—The gauge is usually read once each day, the observer noting the elevation of the water as it rises in a hole cut through the ice, the height of the top of the ice, the thickness of the ice, presence of needle or slush ice, snow on top of ice, ice jams, and any sudden changes in temperature. To do this the observers are provided with an ice chisel for chopping holes, and an L-shaped ice scale to measure the thickness of the ice.

A difficulty which arises in obtaining the thickness of the ice is that in a hole kept open for some time the ice wears away around the bottom of the hole, and may make it necessary to cut a new hole near by, or to enlarge the original.

Any form of gauge may be used, but the chain gauge is the most satisfactory, as the staff gauge, being frozen to the ice, heaves with it, and also in cutting away the ice from around it the figures are effaced. The automatic gauge gives trouble with the well freezing over.

**ESTIMATES OF DAILY DISCHARGE.**—While the run-off, particularly during the winter months, does not vary directly in accordance with the precipitation, the rate at which it reaches the streams is, of course, dependent almost entirely upon the climatic conditions. The climate in the mountains is subject to great extremes, but during the winter almost the entire precipitation is in the form of snow.

There is, therefore, very little surface run-off, and the flow of the streams comes almost entirely from the glaciers, ground waters and lake storage, and except for the losses due to freezing and the slight increases, due to the melting of snow and ice by chinooks (warm winds), the flow in the streams would remain constant or would change gradually.

There are, however, certain local conditions in Western Canada which make it exceptionally difficult to make estimates of the daily discharge during the winter. The gauge height in many cases fluctuates very much, and often sudden rises or drops occur. These rises are often explained by the fact that during very cold spells a great deal of slush, frazil, and anchor ice is formed and chokes up the channel, thus raising the surface of the water, when in reality the discharge is decreasing. Then, again, a chinook causes a sudden rise in temperature and the discharge is often increased, while at the same time the gauge height gradually lowers, evidently because the warmer weather and water have melted out a lot of the ice from the channel and given it a greater carrying capacity.

In order to make reliable estimates of the daily discharge, gaugings must be made at short intervals and the weather conditions and temperatures in the whole of the drainage area above the stations must be very carefully studied.

W. G. Hoyt, District Engineer, Water Resources Branch, U.S. Geological Survey, has made an exhaustive study of methods for estimating the flow when streams are frozen. The various methods described by him in an article in "Engineering News" on April 10, 1913, and Water-Supply Paper 337, published by the United States Geological Survey, in 1913, and modifications of them, are used. The graphic method of interpolation has been found to be generally applicable, but as the precipitation during the winter months has so little effect upon the run-off during that period, it is seldom plotted on the sheets. It is also considered that the extremes and ranges of temperatures are better guides for interpolation than the mean temperatures, and the minimum and maximum temperatures are both plotted and given due consideration rather than the mean temperatures.

The weather conditions and temperatures at the gauging station are not always typical for the whole drainage basin above, and care must therefore be taken to have the meteorological observations made at some other place, or, if necessary, at two or more places. Of course, care must be taken to study all the possible conditions which may affect the estimates.

Plate 4 shows typical conditions and illustrates the graphic method of interpolating the daily discharges.

Additional information on this subject may be found in the appendix of the 1914 report.

#### RATING CURRENT-METERS.

Each meter is rated before being used, in order to determine the relation between the revolutions of the wheel and the velocity of the water. The meter is driven at a uniform rate of speed through still water for a given distance, and the number of revolutions of the wheel and the time are recorded. From this data the number of revolutions per second and the corresponding velocity per second are computed. Tests are made for speeds varying from the slowest which will cause the wheel to revolve to several feet per second. The results of these

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runs, when plotted with revolutions per second as abscissae, and velocity in feet per second as ordinates, locate points that define the meter rating-curve, which for all meters is practically a straight line. From this curve a meter rating table is prepared. Theoretically, the rating for all meters of the same make and type should be the same, but as the result of slight variations in construction and in the bearing of the wheel on the axis at different velocities, the ratings differ.

After a meter has been in use for some time the cups may have received small injuries, or the bearing of the wheel on the axis may have changed owing to unavoidable rough usage. These changes will affect the running of the meter and change its rating. As a consequence, each meter is re-rated at regular intervals and a new rating curve and table prepared.

Descriptions of the rating station, discussions of the methods employed, and the results of ratings, are given in the Reports of Progress of Stream Measurements for the years 1911 and 1912.

## PEACE RIVER DRAINAGE BASIN.

*General Description.*

Peace River is the largest and longest tributary of the McKenzie River. It is formed by the confluence of the Finlay and Parsnip Rivers, both of which rise in and drain a large district lying along the eastern slope of the Rocky Mountains in Northern British Columbia.

From its head the Peace flows in a general easterly direction, through a large plateau, some 300 miles to the mouth of the Smoky River, its largest and most important tributary. Between these two points there are a few small streams entering the Peace, the most notable being the Pine River, which rises in the hills in British Columbia near the Alberta line.

From the mouth of the Smoky, the river flows north for about 250 miles, nearly to Fort Vermilion, then pursues a northeasterly course for about 200 miles where it is joined by the overflow from Lake Athabaska, forming the Great Slave River. The territory drained by this portion of the Peace is bounded on the north by the Laird River and on the south and east by the Fraser and Athabaska Rivers.

Of several streams discharging their waters into the Peace between the mouth of the Smoky and Lake Athabaska there are only two that drain a very large area. These are the Wakiskaw and Red Rivers, both of which rise on the height of land west of the Athabaska and drain a large low country lying between the Peace and Athabaska Rivers, and north of the Lesser Slave Lake.

Aside from these two rivers and the Smoky, which receives a small portion of its supply from a thinly wooded and prairie country, the Peace has no important tributaries which cannot be considered as mountain streams. Therefore the stage of the water is governed to a large extent by storage of winter precipitation in the mountains, and floods in the early spring are not usual. However, in July and August, high temperatures and warm rains in the mountains cause the snow-covered portion of the drainage basin to discharge large quantities of water and it is at this time that the greatest floods occur.

In 1915 there were no excessive floods on the Peace River, the maximum stage was reached on the 14th of July and was caused by warm rains in the mountains, the effect of which was more noticeable on the Smoky than on the Peace River (re floods, see also Appendix No. 4).

As yet very little hydrometric work has been done in this district, largely due to the unsettled conditions of the country and the slow methods of transportation. However, the Edmonton, Dunvegan and British Columbia railroad, now under construction, will cut the northern end of the drainage basin, and as the country comprising this portion of the district is being rapidly settled, it is probable that more extensive work will be carried on in the near future.

In 1915, two regular gauging stations were established on the Peace, one on the Smoky, and one on the North Heart River. Miscellaneous discharge measurements were made on the Little Smoky River and on all the larger tributaries between Peace River Crossing and Fort Vermilion.

## SMOKY RIVER AT PRUDENT'S CROSSING.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 10, Tp. 78, Rge. 24, W. 5th Mer., at the ferry crossing between Prudent's Crossing and J. D. McArthur's cache No. 19.

*Records available.*—June 2, 1915, to December 31, 1915.

*Gauge.*—Vertical staff on left bank of river about 200 feet upstream from ferry tower. Elevation of zero maintained at 80.59 feet since establishment.

*Bench-mark.*—Spike driven in poplar stump, on left bank of river about 150 feet upstream from gauge. Assumed elevation 106.14 feet.

*Channel.*—One channel at all stages, shifting.

*Discharge Measurements.*—Made from ferry boat.

*Winter Flow.*—River affected by ice from November to April.

*Observer.*—P. McCallum, June 2 to November 28, 1915. A. Rainville, November 28 to December 31, 1915.

## DISCHARGE MEASUREMENTS of Smoky River at Prudent's Crossing, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 4	P. H. Daniells	753	6,044	3.75	11.42	22,668
June 26	do	800	7,342	4.06	12.92	29,808
June 28	do	887	10,384	5.33	16.52	55,347
Aug. 27	do	652	4,718	2.88	10.43	13,641
Oct. 21	do	971	2,845	3.18	9.23	9,067
Dec. 16	I. R. Strome	635	3,226	0.51	8.61	1,639

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DAILY GAUGE HEIGHT AND DISCHARGE of Smoky River at Prudent's Crossing, for 1915.

DAY.	June.		July.		August.		September.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			12.72	28,382	12.22	24,832	9.92	11,480
2.....	10.52	14,100	12.62	27,672	12.22	24,832	10.02	11,880
3.....	10.72	15,100	12.52	26,962	12.02	23,412	9.52	10,060
4.....	11.42	19,142	12.02	23,412	11.72	21,272	9.22	9,160
5.....	12.92	29,802	11.42	19,142	11.62	20,562	9.12	8,860
6.....	12.62	27,672	11.02	16,720	11.52	19,852	9.22	9,160
7.....	12.42	26,352	11.12	17,320	11.02	16,720	9.22	9,160
8.....	12.22	24,832	10.82	15,600	10.82	15,600	9.02	8,560
9.....	12.52	26,962	10.82	15,600	11.02	16,720	8.72	7,560
10.....	12.32	25,542	11.22	17,920	11.02	16,720	8.52	7,100
11.....	13.92	36,902	15.02	44,712	10.92	16,120	8.52	7,100
12.....	12.62	27,672	18.12	66,722	11.02	16,720	8.62	7,360
13.....	13.52	34,062	20.42	83,052	10.92	16,120	8.52	7,100
14.....	13.62	34,772	21.92	93,702	10.72	15,100	8.42	6,850
15.....	13.42	33,352	21.82	92,992	10.42	13,600	8.42	6,850
16.....	13.22	31,932	21.72	92,282	10.22	12,680	8.42	6,850
17.....	13.62	34,772	21.32	89,442	10.12	12,280	8.62	7,360
18.....	14.52	41,162	20.72	85,182	10.22	12,680	9.02	8,560
19.....	14.62	41,872	20.12	80,922	10.42	13,600	9.32	9,450
20.....	14.42	40,452	19.52	76,662	10.52	14,100	9.32	9,460
21.....	14.12	38,322	18.62	70,272	12.02	23,412	9.62	10,370
22.....	13.62	34,772	17.72	63,882	11.42	19,142	9.52	10,060
23.....	13.12	31,222	16.82	57,492	11.22	17,920	9.22	9,160
24.....	12.72	28,382	15.92	51,102	10.82	15,600	9.02	8,560
25.....	12.62	27,672	15.02	44,712	10.32	13,100	8.92	8,260
26.....	12.92	29,802	14.32	39,742	10.42	13,600	8.92	8,260
27.....	12.62	27,672	13.62	34,772	10.42	13,600	8.82	7,960
28.....	16.52	55,362	13.42	33,352	10.32	13,100	8.82	7,960
29.....	14.22	39,032	12.92	29,802	10.02	11,880	8.62	7,360
30.....	13.32	32,642	12.72	28,382	9.92	11,480	8.52	7,100
31.....			12.42	26,252	10.02	11,880		

DAILY GAUGE HEIGHT AND DISCHARGE of Smoky River at Prudent's Crossing, for 1915.  
—Concluded.

DAY	October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Fee.</i>	<i>Sec.-ft.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>
1.....	8.42	6,850	9.30	9,400	8.69	1,720
2.....	8.42	6,850	9.00	8,500	8.60	1,750
3.....	8.62	7,360	8.80	7,900	8.51	1,730
4.....	8.62	7,360	8.50	7,050	8.42	1,700
5.....	8.62	7,360	8.00	5,800	8.43	1,700
6.....	8.62	7,360	7.82	5,350 <sup>a</sup>	8.44	1,700
7.....	8.52	7,100	7.36	4,320	8.45	1,700
8.....	8.52	7,100	7.60	4,800	8.46	1,660
9.....	8.52	7,100	7.34	4,250	8.48	1,610
10.....	8.42	6,850	7.18	3,980	8.50	1,650
11.....	8.32	6,600	7.00	3,600	8.52	1,660
12.....	8.32	6,600	6.06	1,750	8.52	1,670
13.....	8.32	6,600	7.00	1,750	8.60	1,650
14.....	8.32	6,600	7.34	1,750	8.54	1,640
15.....	8.32	6,600	7.68	1,740	8.56	1,640
16.....	8.32	6,600	7.92	1,750	8.50	1,640
17.....	8.32	6,600	7.76	1,780	8.50	1,650
18.....	8.22	6,350	8.30	1,900	8.50	1,660
19.....	8.72	7,660	8.44	1,800	8.50	1,670
20.....	9.52	10,060	8.48	1,800	8.60	1,650
21.....	9.32	9,460	8.49	1,790	8.80	1,690
22.....	9.02	8,560	8.50	1,800	9.00	1,690
23.....	8.96	8,200	8.51	1,800	9.00	1,690
24.....	8.90	8,200	8.52	1,800	9.00	1,680
25.....	8.80	7,900	8.63	1,790	9.00	1,670
26.....	8.50	7,050	8.64	1,780	8.90	1,630
27.....	8.50	7,050	8.65	1,750	8.80	1,600
28.....	8.50	7,050	8.66	1,720	8.80	1,510
29.....	9.15	8,950	8.67	1,700	8.70	1,410
30.....	9.40	9,700	8.68	1,700	8.60	1,340
31.....	9.40	9,700	.....	.....	8.60	1,270

<sup>a</sup> Ice conditions.

MONTHLY DISCHARGE of Smoky River at Prudent's Crossing, for 1915.

(Drainage area 18,200 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (2-30).....	55,362	14,100	31,422	1.730	1.87	1,806,985
July.....	93,702	15,500	48,199	2.650	3.05	2,963,639
August.....	24,832	11,480	16,395	0.901	1.04	1,008,090
September.....	11,880	6,850	8,503	0.467	0.52	505,798
October.....	10,060	6,350	7,528	0.414	0.48	462,878
November.....	9,400	1,700	3,283	0.180	0.20	195,352
December (1-31).....	1,750	1,270	1,635	0.090	0.10	100,532
The period.....					7.26	7,043,274



## SESSIONAL PAPER No. 25c

## NORTH HEART RIVER AT PEACE RIVER CROSSING.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 29, Tp. 83, Rge. 21, W. 5th Mer., about 200 feet above foot bridge located one-half mile above mouth of river, and 1500 feet above traffic bridge.

*Records Available.*—May 31, 1915, to December 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero maintained at 88.10 feet since establishment.

*Bench-mark.*—Spike driven in 15 inch poplar tree, 30 feet upstream from gauge; assumed elevation 100.00 feet.

*Channel.*—One channel at all stages, fairly permanent.

*Discharge Measurements.*—Made from foot bridge during high water by wading during low water.

*Winter Flow.*—River affected by ice from November to April.

*Observer.*—Ralph Harris.

## DISCHARGE MEASUREMENTS of North Heart River at Peace River Crossing, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 21.....	P. H. Daniells	55	47.0	2.96	1.75	139.0
June 21.....	do	70	67.0	3.01	2.00	202.0
July 12.....	do	90	104.0	3.41	2.50	355.0
Aug. 16.....	do	26	21.0	2.63	1.31	56.0
Oct. 18.....	do	28	25.0	2.27	1.23	56.0
Nov. 1.....	do	35	30.0	2.67	1.44	80.0
Nov. 17.....	I. R. Strome	27	17.8	0.94	1.22	16.9
Dec. 8.....	do	25	10.0	0.97	1.40	9.8

## DAILY GAUGE HEIGHT AND DISCHARGE of North Heart River at Peace River Crossing, for 1915.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.70	128	1.90	175	2.20	262		
2.....	1.70	158	1.90	175	2.10	230		
3.....	1.70	128	1.80	150	2.00	202		
4.....	1.70	128	1.70	128	2.00	202		
5.....	2.10	230	1.70	128	2.00	202		
6.....	2.80	450	1.60	108	1.80	150		
7.....	2.80	482	1.60	108	1.80	150		
8.....	2.80	482	1.60	108	1.70	128		
9.....	3.00	514	1.60	108	1.60	108		
10.....	3.00	514	1.50	90	1.60	108		
11.....	2.90	482	2.50	354	1.50	90		
12.....	2.90	482	2.80	450	1.20	50		
13.....	2.90	482	3.00	514	1.20	50		
14.....	2.90	482	3.00	514	1.20	50		
15.....	2.80	450	3.00	514	1.20	50		
16.....	2.80	450	2.90	482	1.30	60		
17.....	2.80	450	2.90	482	1.30	60		
18.....	2.70	418	2.90	482	1.30	60		
19.....	2.70	418	2.80	450	1.30	60		
20.....	2.60	386	2.80	450	1.30	60		
21.....	2.60	386	2.80	450	1.30	60		
22.....	2.50	354	2.80	450	1.20	50		
23.....	2.50	354	2.80	450	1.20	50		
24.....	2.40	323	2.80	450	1.20	50		
25.....	2.30	292	2.80	450	1.20	50		
26.....	2.30	292	2.80	450	1.10	40		
27.....	2.20	262	2.80	450	1.10	40		
28.....	2.20	262	2.80	450	1.10	40		
29.....	2.10	230	2.80	450	1.10	40		
30.....	2.10	230	2.80	450	1.10	40		
31.....	1.70	128	2.10	230	1.10	40		



DAILY GAUGE HEIGHT AND DISCHARGE of North Heart River at Peace River Crossing, for 1915.  
—Concluded.

DAY.	September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.10	40	1.20	50	1.41	76.0	1.36	10.4
2.....	1.10	40	1.20	50	1.39	73.0	1.36	10.5
3.....	1.10	40	1.30	60	1.37	70.0	1.36	10.5
4.....	1.10	40	1.30	60	1.35	67.0	1.26	10.5
5.....	1.10	40	1.30	60	1.33	64.0	1.36	10.4
6.....	1.10	40	1.30	60	1.31	61.0	1.36	10.2
7.....	1.10	40	1.30	60	1.29	59.0	1.36	10.0
8.....	1.10	40	1.30	60	1.27	57.0	1.26	9.8
9.....	1.10	40	1.20	50	1.25	55.0	1.26	9.8
10.....	1.20	50	1.20	50	1.25	49.0 <sup>a</sup>	1.26	9.8
11.....	1.20	50	1.20	50	1.26	42.0	1.16	9.9
12.....	1.20	50	1.20	50	1.26	34.0	1.16	10.0
13.....	1.20	50	1.10	40	1.26	26.0	1.16	10.0
14.....	1.20	50	1.10	40	1.26	19.5	1.06	10.1
15.....	1.20	50	1.10	40	1.27	17.0	1.06	10.1
16.....	1.30	60	1.20	50	1.27	16.9	1.05	10.2
17.....	1.30	60	1.20	50	1.37	16.9	1.05 <sup>b</sup>	10.2
18.....	1.30	60	1.21	51	1.37	17.0	1.05 <sup>b</sup>	10.1
19.....	1.20	50	1.21	51	1.37	17.0	1.05	10.1
20.....	1.20	50	1.21	51	1.37	16.9	1.05	10.0
21.....	1.20	50	1.21	51	1.37	16.3	1.05	10.0
22.....	1.20	50	1.21	51	1.37	15.7	1.04	10.1
23.....	1.20	50	1.21	51	1.37	15.0	1.04	9.9
24.....	1.20	50	1.21	51	1.37	14.2	1.04	9.7
25.....	1.20	50	1.21	51	1.37	13.5	1.04	9.2
26.....	1.20	50	1.21	61	1.27	12.8	1.04	9.0
27.....	1.30	60	1.31	61	1.27	12.0	1.04	8.9
28.....	1.30	60	1.33	64	1.26	11.4	1.03	8.5
29.....	1.20	50	1.35	67	1.26	10.9	1.03	8.2
30.....	1.20	50	1.37	70	1.26	10.6	1.03	7.8
31.....			1.39	73			1.03	7.5

<sup>a</sup> Ice conditions after Nov. 10.

<sup>b</sup> Gauge heights interpolated.

MONTHLY DISCHARGE of North Heart River at Peace River Crossing, for 1915.

(Drainage area *a* square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum	Mean.	
June (1-30).....	514.0	128.0	357.0	21,243
July.....	514.0	90.0	345.0	21,213
August.....	262.0	40.0	91.0	5,595
September.....	60.0	40.0	49.0	2,916
October.....	73.0	40.0	54.0	3,320
November.....	76.0	10.6	33.0	1,964
December (1-31).....	10.5	7.5	9.7	596
The period.....				56,847

<sup>a</sup> Unable to obtain accurate drainage area from plans available.

## SESSIONAL PAPER No. 25c

## PEACE RIVER AT PEACE RIVER CROSSING.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 29, Tp. 83, Rge. 21, W. 5th Mer., about 1200 feet below mouth of the Heart River 300 feet north of Mr. H. White's house.

*Records Available.*—May 28, 1915, to December 31, 1915.

*Gauge.*—Vertical staff, on left bank of river. Elevation of zero maintained at 70.70 feet May 28 to November 13. Elevation of zero maintained at 68.82 feet November 13 to December 31.

*Bench-mark.*—Spike driven in stump of poplar tree, on left bank about 200 feet upstream from gauge. Assumed elevation 93.61 feet.

*Channel.*—One channel at all stages, fairly permanent.

*Discharge Measurements.*—Made from ferry boat at ferry crossing, about 150 feet above mouth of Heart River. Discharge of Heart River was added to discharge of Peace River when curve was plotted.

*Winter flow.*—River affected by ice from November to May.

*Observer.*—Henry White.

## DISCHARGE MEASUREMENTS of Peace River at Peace River Crossing, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 27 and 28. ....	P. H. Daniells. ....	1,500	24,117	6.57	10.80	158,449
June 24. ....	do. ....	1,456	22,690	6.22	9.95	141,234
July 14. ....	do. ....	1,610	41,412	8.17	20.50	338,337
Aug. 17. ....	do. ....	1,237	17,040	3.34	3.95	56,843
Oct. 18. ....	do. ....	1,129	12,278	1.81	0.98	22,374

NOTE.—Discharge above mouth of Heart River.

## DISCHARGE MEASUREMENTS of Peace River at Peace River Crossing, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 27 and 28. ....	P. H. Daniells. ....				10.80	158,577
June 24. ....	do. ....				9.95	141,557
July 14. ....	do. ....				20.50	338,851
Aug. 17. ....	do. ....				3.95	56,903
Oct. 18. ....	do. ....				0.98	22,435
Dec. 13. ....	I. R. Strome. ....	1,335	18,353	0.58	4.76	10,604

NOTE.—Discharge below mouth of Heart River. At gauge.

## DAILY GAUGE HEIGHT AND DISCHARGE of Peace River at Peace River Crossing, for 1915.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			10.60	153,600	9.20	130,950	6.80	95,550
2.....			10.10	145,350	8.80	124,850	6.30	88,550
3.....			9.80	140,500	8.40	118,850	6.30	88,550
4.....			9.60	137,300	8.10	114,350	6.10	85,750
5.....			9.90	142,100	7.90	111,400	6.00	84,350
6.....			9.80	140,500	7.50	105,600	5.70	80,300
7.....			9.70	138,900	7.50	105,600	5.60	78,950
8.....			9.50	135,700	7.60	107,050	5.60	78,950
9.....			9.45	134,900	7.40	104,150	5.40	76,250
10.....			9.50	135,700	7.30	102,700	5.20	73,550
11.....			9.50	135,700	7.35	103,425	5.10	72,200
12.....			9.80	140,500	14.50	224,850	4.80	68,150
13.....			9.45	134,900	19.30	316,050	4.60	65,450
14.....			9.40	134,100	20.50	338,850	4.40	62,800
15.....			9.50	135,700	18.30	297,050	4.20	60,200
16.....			9.40	134,100	15.10	336,250	4.00	57,600
17.....			9.70	138,900	14.50	224,850	3.90	56,400
18.....			10.75	156,075	13.70	209,650	3.80	55,200
19.....			12.30	183,400	12.90	194,500	3.65	53,400
20.....			12.20	181,550	12.10	179,700	3.60	52,800
21.....			11.30	165,350	10.80	156,900	3.70	54,000
22.....			10.60	153,600	9.90	142,100	3.95	57,000
23.....			10.20	147,000	9.70	132,500	3.80	55,200
24.....			9.70	138,900	9.10	129,400	3.60	52,800
25.....			9.35	133,300	8.90	126,350	3.55	52,200
26.....			9.10	129,400	8.60	121,850	3.30	49,200
27.....			9.40	134,100	8.30	117,350	3.20	48,000
28.....	10.80	156,900	10.40	150,300	8.10	114,350	3.10	46,800
29.....	11.30	165,350	10.40	150,300	8.00	112,850	2.90	44,400
30.....	11.20	163,600	10.10	145,250	7.60	107,050	2.85	43,800
31.....	11.00	160,200			7.30	102,700	2.95	45,000

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## DAILY GAUGE HEIGHT AND DISCHARGE of Peace River at Peace River Crossing, for 1915.

DAY.	September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.85	43,800	1.00	22,600	2.75	42,600	2.62	11,120
2.....	2.60	40,800	0.95	22,050	2.60	40,800	2.72	11,100
3.....	2.65	41,400	0.90	21,500	2.30	37,200	2.67	11,120
4.....	2.55	40,200	0.95	22,050	2.00	33,600	2.72	11,120
5.....	2.25	36,600	1.05	23,150	1.70	30,300	2.67	11,140
6.....	2.30	37,200	1.05	23,150	1.40	27,000	2.67	11,140
7.....	2.20	36,000	1.00	22,600	1.20	24,800	2.62	11,050
8.....	2.15	35,400	1.00	22,600	1.60	29,200	2.67	11,000
9.....	2.30	37,200	1.00	22,600	1.10	23,700	2.87	10,900
10.....	2.20	36,000	1.00	22,600	0.80	20,400	2.82	10,720
11.....	2.00	33,600	0.95	22,050	0.60	18,200	2.87	10,630
12.....	1.95	33,050	0.90	21,500	0.30	14,900	2.87	10,600
13.....	1.90	32,500	0.88	21,280	0.00	11,600	2.87	10,620
14.....	1.80	31,400	0.85	20,950	1.25	11,540 <sup>a</sup>	2.87	10,690
15.....	1.70	30,300	0.85	20,950	1.25	11,540	2.87	10,740
16.....	1.65	29,750	0.85	20,950	1.30	11,560	2.87	10,770
17.....	1.50	28,100	0.85	20,950	1.35	11,580	2.87	10,770
18.....	1.30	25,900	1.02	22,820	1.75	11,560	2.87	10,730
19.....	1.45	27,550	1.09	23,590	2.30	11,510	2.87	10,720
20.....	1.50	28,100	1.96	33,160	2.30	11,500	2.87	10,740
21.....	1.60	29,200	2.13	35,160	2.22	11,490	2.87	10,790
22.....	1.70	30,300	2.50	39,600	2.15	11,490	2.87	10,750
23.....	1.65	29,750	2.47	39,240	2.40	11,500	2.87	10,700
24.....	1.50	28,100	2.24	36,480	2.70	11,490	2.87	10,700
25.....	1.40	27,000	2.06	34,320	2.50	11,490	2.87	10,650
26.....	1.35	26,450	1.88	32,280	2.15	11,430	2.92	10,600
27.....	1.40	27,000	2.01	33,720	2.08	11,370	2.92	10,500
28.....	1.30	25,900	2.04	34,080	2.52	11,300	2.92	10,420
29.....	1.20	24,800	1.87	32,170	2.62	11,220	2.92	10,300
30.....	1.10	23,700	2.40	38,400	2.62	11,160	2.92	10,250
31.....			2.78	42,960			2.87	10,300

<sup>a</sup> Ice conditions.

## MONTHLY DISCHARGE of Peace River at Peace River Crossing, for 1915.

(Drainage area <sup>a</sup> square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet
	Maximum.	Minimum.	Mean.	
May (28-31).....	165,350	156,900	161,512	1,281,113
June.....	183,400	129,400	144,236	8,582,924
July.....	338,850	102,700	158,518	9,747,116
August.....	95,550	43,800	63,979	3,933,919
September.....	43,800	23,700	31,902	1,898,318
October.....	42,960	20,950	27,468	1,688,948
November.....	42,600	11,160	18,301	1,088,985
December (1-31).....	11,140	10,250	10,786	663,205
The period.....				28,884,528

<sup>a</sup> Unable to obtain accurate drainage area from plans available.

## PEACE RIVER AT FORT VERMILION.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 23, Tp. 108, Rge. 13, W. 5th Mer. at the mounted police barracks, about one mile west of the Hudson's Bay Company's store. Winter section NE.  $\frac{1}{4}$  Sec. 24, Tp. 108, Rge. 13, W. 5th.

*Records available.*—August 8, 1915, to November 5, 1915, and December 16-31, 1915.

*Gauge.*—Vertical staff; elevation of zero maintained at 66.50 feet. Winter gauge elevation of zero 68.81 feet.

*Bench-mark.*—Spike driven in four inch poplar stump; 300 feet upstream from gauge, 150 feet from edge of river; assumed elevation 100.00 feet.

*Channel.*—One channel at all stages, shifting.

*Discharge measurement.*—Made from boat, about one and one-half miles below gauge at Hudson's Bay Company's east property line.

*Winter flow.*—River affected by ice from November to May.

*Observer.*—R. W. McLeod.

## DISCHARGE MEASUREMENTS of Peace River at Fort Vermilion, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 8	P. H. Daniells	1,814	37,161	2.19	13.11	81,530
Sept. 15, 16, 17	do	1,745	27,356	1.10	7.40	30,128
Sept. 29	do	1,741	27,282	1.05	7.00	27,414
Oct. 4	do	1,734	26,598	0.98	6.48	26,159
Dec. 17-20	do	1,100	19,424	0.65	3.22	12,648
Dec. 22-24	do	1,100	19,146	0.57	2.95	10,930
Dec. 27, 28	do	1,100	18,791	0.56	2.78	10,485
Dec. 30, 31	do	1,110	19,036	0.62	3.08	11,874

## DAILY GAUGE HEIGHT AND DISCHARGE of Peace River at Fort Vermilion, for 1915.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			9.57	46,660	6.80	27,000	7.90			
2.			9.47	45,760	6.70	26,550	8.00			
3.			9.37	44,960	6.55	25,875	8.10			
4.			9.27	44,160	6.45	25,425	8.20			
5.			9.04	42,320	6.40	25,200	8.45			
6.			8.89	41,120	6.30	24,800				
7.			8.64	39,120	6.30	24,800				
8.	13.11	81,600	8.44	37,520	6.30	24,800				
9.	12.99	80,400	8.24	35,920	6.30	24,800				
10.	12.79	78,400	8.07	34,690	6.30	24,800				
11.	12.59	76,400	7.97	33,990	6.30	24,800				
12.	12.39	74,400	7.87	33,290	6.30	24,800				
13.	12.19	72,400	7.77	32,590	6.30	24,800				
14.	11.99	70,400	7.64	31,640	6.30	24,800				
15.	11.79	68,400	7.44	30,440	6.20	24,400				
16.	11.49	65,400	7.50	30,800	6.20	24,400			3.20	12,650
17.	11.29	63,400	7.20	29,000	6.20	24,400			3.20	12,650
18.	11.09	61,400	7.15	28,750	6.20	24,400			3.22	12,648
19.	10.79	58,400	7.10	28,500	6.15	24,200			3.23	12,648
20.	10.69	57,400	7.10	28,500	6.10	24,000			3.23	12,750
21.	10.49	55,400	6.95	27,750	6.10	24,000			3.21	12,700
22.	10.39	54,405	6.70	26,550	6.10	24,000			3.06	11,200
23.	10.39	54,405	6.50	25,650	6.00	23,600			2.95	10,930
24.	10.39	54,405	7.50	30,800	6.00	23,600			2.85	10,700
25.	10.39	54,405	7.25	29,300	6.00	23,600			2.76	10,475
26.	10.39	54,405	7.20	29,000	6.10a				2.70	10,350
27.	10.29	53,455	7.15	28,750	6.10				2.67	10,250
28.	10.19	52,505	7.00	28,000	6.50				2.82	10,750
29.	10.04	51,080	6.90	27,500	6.85				2.94	11,250
30.	9.84	49,180	6.80	27,000	7.10				3.04	11,725
31.	9.74	48,260			7.50				3.10a	11,950

a to a Ice conditions Oct. 26 to Dec. 31.

No gauge heights obtained from Nov. 6 to Dec. 15 inclusive.



View looking upstream from Peace River Crossing, showing mouth of North Heart River and location of ferry. Taken on June 6, 1915, by P. H. Daniells.



Hudson's Bay Company Post at Fort Vermilion, on Peace River.  
Taken on August 10, 1915, by P. H. Daniells.





## MONTHLY DISCHARGE of Peace River at Fort Vermilion, for 1915.

(Drainage area  $\alpha$  square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
August (8-31).....	81,600	48,260	62,096	2,955,273
September.....	46,660	25,650	33,334	1,983,510
October (1-25).....	27,000	23,600	24,714	1,225,197
December (16-31).....	12,750	10,250	11,602	368,108
The period.....				6,532,088

 $\alpha$  Unable to obtain accurate drainage area from plans available.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Peace River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Aug. 12....	P. H. Daniells....	Battle River.....	96-20-5.....	85	118	2.93	346
Sept. 8....	do.....	do.....	do.....	53	36	2.19	79
Aug. 12....	do.....	Buffalo River.....	102-20-5.....	55	65	2.68	174
Sept. 10....	do.....	do.....	do.....	28	26	3.46	97
Sept. 7....	do.....	Cadotte River.....	19-89-21-5.....	45	58	3.24	188
Aug. 26....	do.....	Little Smoky River.....	15-77-14-5.....	138	534	1.78	952
Sept. 7....	do.....	White Mud River.....	25-85-21-5.....	31	37	3.32	123

## ATHABASKA RIVER DRAINAGE BASIN.

*General Description.*

Athabaska River rises on the eastern slope of the Rocky Mountains and flows in a north-easterly direction for about one thousand miles, eventually emptying into Lake Athabaska.

The Athabaska basin forms the most southerly portion of the great MacKenzie system and the portion dealt with in this report comprises only the headwaters.

Rising in country very similar to the watershed of the other streams of importance in Alberta, it flows out of the mountains and then through foothill country. From the foothills to the lake the basin consists of stretches of muskeg and uplands, well timbered with spruce and pine.

The general character of the basin is such that the winter precipitation or snowcover is conserved to a great extent and floods in the early spring are not usual. However, in June, July and August rains and warm winds cause the upper parts of the system to discharge large quantities of the snow water from the higher peaks and glaciers, and when rains of any magnitude occur the invariable result is a flood. The muskeg country is a great source of storage, but when its capacity is reached, it accelerates rather than retards the run-off.

The main transcontinental lines of the Grand Trunk Pacific and the Canadian Northern railway cross the upper portion of this drainage basin, and transportation is now a much easier problem than in the past.

Many valuable deposits of coal, limestone and other minerals are found in this basin, and, on account of these as well as the many power possibilities and stretches of timber and pulpwood, it is expected that this country will develop very much during the next few years.

A very full description of this drainage basin was published as an appendix to the 1913 report.

A special report upon the floods in this drainage basin is given in Appendix No. 4 of this report.

## MIETTE RIVER NEAR JASPER.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 9, Tp. 45, Rge. 1, W. 6th Mer., at a traffic bridge about 2 miles southwest of Jasper and about one mile from the mouth of the river.

*Records available.*—Gauge heights available from May 23, 1914, to December 31, 1915. Discharge measurements available from February 13, 1913, to December 31, 1915.

*Gauge.*—Vertical staff, on downstream side of bridge pier, about 20 feet from the left bank, and maintained at zero elevation of 3,383.41 feet since establishment.

*Bench-mark.*—Six inch spike driven in 15 inch spruce tree on the left bank of the river and about 30 feet east of the gauge. Elevation 3,395.17 feet. (Grand Trunk Pacific Railway datum.)

*Channels.*—Three channels at all stages, slightly shifting.

*Discharge measurements.*—Made from a bridge.

*Winter flow.*—River affected by ice from November to April. Discharge measurements made at a point about 1000 feet downstream from regular section.

*Floods.*—Floods occurred on June 26 and 27, the maximum gauge height being 11.55 feet. The river overflowed its banks at a gauge height of 9 feet. The maximum discharge (estimated) was 3,000 second feet.

*Observer.*—Matt Crevie, January 1 to January 23. D. Gallacher, January 24 to February 10. A. B. Webb, February 11 to December 31.

## DISCHARGE MEASUREMENTS of Miette River near Jasper, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 18.	R. J. McGuinness	45.0	107	0.22	1.96	24.0
Feb. 10.	do	39.0	89	0.30	2.11	27.0
Mar. 17.	J. M. Paul	39.0	71	0.28	1.72	19.9
April 10.	do	47.0	158	0.53	0.51	90.0
April 24.	do	72.5	287	0.61	1.45	174.0
May 15.	do	75.5	336	1.39	3.18	468.0
June 3.	do	75.5	467	1.52	4.14	711.0
June 24.	do	75.5	512	1.69	4.71	866.0
June 28.	do	75.5	818	2.28	7.95	1,867.0
June 29.	do	75.5	717	1.95	6.62	1,401.0
July 12.	do	75.5	531	1.73	4.93	919.0
July 29.	do	75.5	436	1.32	3.62	577.0
Aug. 16.	do	75.5	428	1.10	3.31	473.0
Aug. 31.	do	75.5	394	1.03	3.05	406.0
Sept. 20.	do	72.5	301	0.66	1.64	199.0
Oct. 5.	do	72.5	288	0.56	1.44	162.0
Oct. 25.	do	72.5	290	0.47	1.44	135.0
Nov. 22.	do	43.0	121	0.66	1.40	80.0
Dec. 13.	do	43.0	105	0.45	1.34	47.0
Dec. 19.	do	43.0	99	0.48	1.38	48.0
Dec. 31.	R. J. McGuinness	42.0	93	0.42	1.29	39.0

## SESSIONAL PAPER No. 25c

## DAILY GAUGE HEIGHT AND DISCHARGE of Miette River near Jasper, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.12	45a	2.01	23	1.57	20	0.30	77	2.40	301	4.65	842
2.....	2.15	44	1.91	26	1.42	15	0.33	79	2.30	284	4.75	870
3.....	2.14	43	2.01	29	1.62	18	0.49	88	2.35	292	4.15	704
4.....	2.08	44	2.16	21	1.67	20	0.68	101	3.00	418	4.20	718
5.....	2.10	41	1.96	25	1.72	16	0.90	118	3.30	485	4.35	758
6.....	2.07	43	2.06	24	1.61	21	0.80	110	4.10	691	4.25	732
7.....	2.10	44	2.04	23	1.76	23	0.70	102	4.55	814	3.90	638
8.....	2.12	43	2.01	20	1.78	25	0.67	100	5.10	970	3.90	638
9.....	2.08	42	2.11	24	1.78	27	0.60	95	5.40	1,057	4.45	786
10.....	2.06	38	2.11	27	1.81	28	0.53	91	5.75	1,158	4.10	691
11.....	2.05	33	2.11	30	1.82	30	0.58	94	5.33	1,037	3.80	612
12.....	2.06	30	2.16	31	1.80	29	0.60	95	5.25	1,014	3.85	625
13.....	2.03	34	2.03	28	1.73	27	0.90	118	4.00	664	4.15	704
14.....	2.10	35	1.96	25	1.60	26	0.95	122	3.55	548	4.45	786
15.....	2.13	26	2.01	25	1.85	25	0.95	122	3.20	462	4.60	828
16.....	2.04	15	2.03	28	1.97	30	0.98	124	2.80	376	5.30	1,028
17.....	1.90	19	1.98	31	1.69	20a	1.45	168	2.90	396	5.70	1,144
18.....	1.97	24	1.80	29	1.64	25b	1.50	174	2.95	407	5.05	956
19.....	2.00	26	1.68	26	1.56	10	1.65	192	3.90	638	4.55	814
20.....	2.04	21	1.65	19	1.24	10	1.70	198	4.70	856	4.60	828
21.....	1.61	17	1.60	16	1.09	8	1.65	192	5.50	1,086	4.50	800
22.....	2.17	30	1.57	14	0.79	20	1.40	163	5.20	999	4.40	772
23.....	2.15	30	1.44	17	0.69	17	1.25	148	4.95	926	4.80	834
24.....	2.21	32	1.47	21	0.46	24	1.45	168	4.80	854	4.70	856
25.....	2.01	26	1.50	24	0.24	42	1.50	174	4.30	745	5.10	970
26.....	1.76	19	1.64	22	0.29	64	1.65	192	4.10	691	11.55	2,996
27.....	1.81	19	1.58	24	0.14	62	1.63	190	4.00	664	9.85	2,432
28.....	2.31	24	1.78	26	0.09	60b	1.45	168	3.90	638	8.00	1,860
29.....	2.51	30	.....	.....	0.19	72c	1.55	180	4.10	691	6.70	1,446
30.....	1.76	17	.....	.....	0.29	76	2.55	328	3.80	612	6.50	1,384
31.....	1.81	24	.....	.....	0.27	76	.....	.....	3.70	586	.....	.....

a Ice conditions January 1 to March 17.

b Ice breakup March 18 to 28; discharges estimated.

c Open water March 29 to Nov. 2.

DAILY HAUGE HEIGHT AND DISCHARGE of Miette River near Jasper, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	6.35	1,338	3.65	573	2.90	396	1.25	148	1.50	174	1.34	58
2	6.00	1,232	3.95	651	2.40	301	1.20	144	1.35	158 <sup>c</sup>	1.42	51
3	5.50	1,086	4.10	691	2.30	284	1.35	158	1.00	134 <sup>d</sup>	1.45	56
4	5.00	941	4.00	664	2.30	284	1.50	174	0.95	115	1.50	57
5	5.00	941	3.65	573	2.30	284	1.44	167	1.20	129	1.25	50
6	5.20	999	3.55	548	2.25	276	1.25	148	1.10	115	1.20	42
7	5.00	941	3.55	548	2.10	252	1.20	144	1.00	120	1.15	37
8	4.60	828	3.50	535	2.00	237	1.25	148	1.30	128	1.45	35
9	4.40	772	3.30	485	2.00	237	1.25	148	1.55	131	1.50	46
10	4.45	786	3.30	485	1.90	223	1.10	135	1.50	121	1.45	46
11	4.90	912	3.30	485	1.70	198	1.05	130	1.45	112	1.25	41
12	4.85	898	3.30	485	1.65	192	1.05	130	1.30	114	1.45	42
13	4.50	800	3.20	462	1.50	174	1.05	130	1.35	102	1.34	47
14	4.50	800	3.20	462	1.50	174	1.05	130	1.25	106	1.40	49
15	4.70	856	3.20	462	1.55	180	1.00	126	1.60	92 <sup>d</sup>	1.45	46
16	4.90	912	3.20	462	1.55	180	1.00	126	1.55	88 <sup>e</sup>	1.35	48
17	5.45	1,072	5.20	999	1.55	180	1.05	130	1.50	83	1.38	46
18	4.90	912	3.30	485	1.55	180	1.05	130	1.34	77	1.35	47
19	5.00	941	3.50	535	1.80	210	1.25	148	1.35	80	1.30	48
20	4.50	800	3.40	510	1.65	192	1.45	168	1.45	83	1.35	48
21	4.45	786	3.30	485	1.50	174	1.30	153	1.25	75	1.35	46
22	4.75	870	3.30	485	1.50	174	1.20	144	1.40	80	1.30	44
23	4.45	786	3.20	462	1.45	168	1.40	163	1.38	81	1.30	40
24	4.10	691	3.10	440	1.45	163	1.55	180	1.30	75	1.25	39
25	4.00	664	3.10	440	1.40	163	1.45	168	1.30	74	1.20	37
26	3.90	638	3.00	418	1.40	163	1.40	163	1.35	75	1.25	37
27	3.85	625	2.70	356	1.25	148	1.45	168	1.15	69	1.30	39
28	3.80	612	2.90	396	1.20	144	1.50	174	1.25	60	1.35	42
29	3.60	560	2.85	386	1.20	144	1.65	192	1.45	58	1.25	38
30	3.65	573	2.90	396	1.15	140	1.65	192	1.60	66	1.20	35
31	3.65	573	3.00	418			1.70	198			1.28	39 <sup>e</sup>

<sup>c</sup> Open water March 29 to Nov. 2.<sup>d</sup> Ice forming Nov. 3 to 15; discharges estimated.<sup>e</sup> Ice conditions Nov. 16 to Dec. 31.

## MONTHLY DISCHARGE of Miette River near Jasper, for 1915.

(Drainage area 258 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	45	15	31	0.120	0.14	1,906
February	31	14	24	0.093	0.10	1,333
March	76	8	31	0.120	0.14	1,906
April	328	77	142	0.550	0.61	8,450
May	1,158	284	690	2.674	3.08	42,426
June	2,996	612	1,004	3.891	4.34	59,742
July	1,338	560	843	3.267	3.77	51,834
August	999	356	509	1.973	2.28	31,297
September	396	140	207	0.802	0.89	12,317
October	198	126	153	0.593	0.68	9,408
November	174	58	99	0.384	0.43	5,891
December	58	35	44	0.170	0.20	2,705
The year					16.66	229,215

## SESSIONAL PAPER No. 25c

## ATHABASKA RIVER AT JASPER.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 15, Tp. 45, Rge. 1, W. 6th Mer., about one-half mile east of the Grand Trunk Pacific station and three-quarters of a mile below the mouth of the Miette River.

*Records available.*—March 4, 1913, to December 31, 1915.

*Gauge.*—Vertical staff, on left bank and 800 feet below cable. Datum maintained at 3,360.70 feet during 1913, and at 3,360.68 feet during 1914 and 1915.

*Bench-mark.*—Permanent iron bench-mark 50 feet south of gauge; elevation 3,376.85 feet. (Grand Trunk Pacific Railway datum.)

*Channel.*—Slightly shifting.

*Discharge measurements.*—Made from a cable car.

*Winter flow.*—River affected by ice from November to April. Discharge measurements made at a point about  $1\frac{1}{2}$  miles below the regular station.

*Floods.*—Floods occurred on June 26 and 27, the maximum gauge height being 10.20 feet. As the banks are high no damage was done. The maximum discharge (estimated) was 19,500 feet.

*Observer.*—M. Crevie, January 1 to January 23. D. Gallacher, January 24 to February 10. A. B. Webb, February 11 to December 31.

## DISCHARGE MEASUREMENTS of Athabaska River at Jasper, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 18.....	R. J. McGuinness.....	185	187	2.85	2.03	534
Feb. 10.....	do.....	180	174	2.80	1.80	486
Mar. 16.....	J. M. Paul.....	182	173	2.41	1.75	417
April 10.....	do.....	185	196	2.51	1.92	493
April 24.....	do.....	189	246	3.19	2.38	786
May 15.....	do.....	267	608	4.98	4.40	3,026
June 3.....	do.....	357	872	5.32	5.32	4,642
June 28.....	do.....	414	2,255	7.01	8.84	15,806
June 29.....	do.....	413	2,083	6.52	8.38	13,574
July 14.....	do.....	407	1,349	5.73	6.62	7,731
July 30.....	do.....	409	1,902	6.34	7.83	12,062
Aug. 19.....	do.....	416	1,805	6.24	7.82	11,262
Sept. 1.....	do.....	409	1,387	5.82	6.68	8,099
Sept. 21.....	do.....	237	441	5.20	3.04	2,296
Oct. 6.....	do.....	198	326	4.96	2.38	1,616
Oct. 9.....	do.....	195	297	4.87	2.20	1,447
Oct. 26.....	do.....	196	296	4.57	2.07	1,352
Nov. 22.....	do.....	190	194	3.30	2.02	639
Dec. 13.....	do.....	188	330	2.50	4.56	826
Dec. 30.....	R. J. McGuinness.....	79	162	2.60	2.69	422

## DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska River at Jasper, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.72	540 <sup>a</sup>	2.05	488	1.73	435	1.82	440	2.85	1,135	5.20	4,400
2.....	3.78	552	1.85	484	1.71	432	1.87	465	3.00	1,280	5.50	5,000
3.....	3.75	560	1.95	481	1.70	429	2.25	685	3.10	1,380	5.30	4,600
4.....	3.62	561	2.05	488	1.70	428	2.32	734	3.25	1,530	5.40	4,800
5.....	3.45	563	1.95	489	1.73	428	2.22	664	3.50	1,800	5.70	5,420
6.....	3.54	562	2.00	485	1.69	428	2.13	608	4.10	2,560	5.60	5,210
7.....	3.01	566	2.05	486	1.69	428	2.16	626	4.05	2,490	6.00	6,120
8.....	2.73	555	2.10	483	1.69	428	2.08	578	5.75	5,530	6.00	6,120
9.....	2.69	545	1.85	490	1.69	426	1.99	525	5.50	5,000	6.00	6,120
10.....	2.42	542	1.80	486	1.69	425	1.94	500	6.00	6,120	5.20	4,400
11.....	2.27	543	1.79	476	1.70	423	1.95	505	5.70	5,420	5.10	4,200
12.....	2.26	542	1.81	467	1.72	422	2.08	578	5.60	5,210	5.20	4,400
13.....	2.24	537	1.78	464	1.70	421	2.20	650	5.00	4,000	5.50	5,000
14.....	2.13	534	1.78	463	1.72	421	2.18	638	4.60	3,320	5.65	5,315
15.....	2.05	533	1.75	463	1.75	419	2.20	650	4.40	3,010	5.85	5,760
16.....	1.99	533	1.78	462	1.75	417	2.25	685	4.10	2,560	6.50	7,360
17.....	2.01	534	1.79	459	1.80	415	2.55	895	4.25	2,785	7.10	9,150
18.....	2.00	534	1.76	450	1.85	417	2.55	895	4.30	2,860	6.60	7,630
19.....	1.99	530	1.74	441	1.85	424	2.65	970	4.70	3,480	6.55	7,495
20.....	2.11	528	1.71	439	1.86	426	2.72	1,026	5.40	4,800	6.60	7,630
21.....	1.99	525	1.70	439	1.84	429	2.59	923	6.10	6,360	6.60	7,630
22.....	2.87	518	1.70	439	1.94	437	2.46	832	6.00	6,120	6.50	7,360
23.....	2.98	515	1.69	439	2.02	437	2.44	818	6.00	6,120	7.10	9,150
24.....	2.96	518	1.70	438	1.89	431	2.32	734	5.75	5,530	7.00	8,820
25.....	2.46	526	1.71	439	1.74	415	2.50	860	5.50	5,000	7.50	10,500
26.....	2.16	532	1.72	440	1.73	407	2.60	930	5.55	5,105	9.60 <sup>c</sup>	18,620
27.....	2.21	534	1.72	439	1.78	408	2.60	930	5.25	4,500	9.85 <sup>c</sup>	19,620
28.....	2.71	529	1.72	438	1.81	409	2.50	860	5.00	4,000	8.65	14,825
29.....	2.96	519	.....	.....	1.73	403 <sup>a</sup>	2.60	930	5.50	5,000	8.30	13,460
30.....	2.91	504	.....	.....	1.73	402 <sup>b</sup>	3.15	1,430	5.20	4,400	8.10	12,680
31.....	2.96	494	.....	.....	1.81	435	.....	.....	5.10	4,200	.....	.....

<sup>a</sup> Ice conditions Jan. 1 to March 29.<sup>b</sup> Open water March 30 to Nov. 2.<sup>c</sup> G. H. is mean of observer's reading and H. W. L.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska River at Jasper, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	8.00	12,300	7.85	11,745	6.60	7,900	2.85	2,075	2.25	1,500	1.24	640
2.....	7.65	11,020	7.90	11,930	6.70	8,160	2.75	1,970	2.05	1,340 <sup>b</sup>	1.29	640
3.....	7.50	10,500	9.00	16,220	5.60	5,790	2.85	2,075	2.25	1,284 <sup>d</sup>	1.49	650
4.....	7.65	11,020	8.50	14,240	6.50	7,650	2.90	2,130	2.00	1,224	2.14	654
5.....	7.70	11,200	8.00	12,300	6.00	6,550	2.80	2,020	2.15	1,172	1.04	655
6.....	7.90	11,930	8.00	12,300	5.90	6,360	2.34	1,576	2.06	1,140	0.62	657
7.....	8.20	13,070	7.95	12,115	5.10	4,960	2.30	1,540	2.06	1,160	0.52	664
8.....	8.00	12,300	8.00	12,300	4.55	4,130	2.25	1,500	1.96	1,082	0.47	696
9.....	7.60	10,840	8.00	12,300	4.00	3,410	2.20	1,460	1.96	910	0.72	718
10.....	7.45	10,330	8.00	12,300	3.95	3,345	2.10	1,380	1.76	825	3.97	731
11.....	6.90	8,500	8.00	12,300	3.60	2,920	2.01	1,308	1.57	780	4.30	757
12.....	6.50	7,360	7.95	12,115	3.50	2,800	2.06	1,348	1.57	768	3.40	802
13.....	6.45	7,230	7.90	11,930	3.20	2,460	2.06	1,348	1.52	755	4.55	826
14.....	6.80	7,630	7.80	11,560	3.00	2,240	2.01	1,308	1.47	743	3.50	828
15.....	7.00	8,820	7.75	11,350	3.10	2,350	2.01	1,308	1.77	750	4.10	830
16.....	6.80	8,200	8.10	12,680	3.00	2,240	1.97	1,279	1.73	760	3.70	840
17.....	7.00	8,820	8.00	12,300	3.00	2,240	2.02	1,316	1.68	737	3.90	845
18.....	6.85	8,350	8.10	12,680	3.00	2,240	2.22	1,476	1.43	659	4.60	849
19.....	7.00	8,820	7.90	11,930	3.00	2,240	2.52	1,740	1.78	667	4.30	851
20.....	7.00	8,820	7.90	11,930	3.30	2,570	2.62	1,840	1.78	658	4.00	853
21.....	6.90	8,500	7.90	11,930	3.00	2,240	2.48	1,702	1.73	648	2.29	850
22.....	7.85	11,745	8.00	12,300	3.00	2,240	2.28	1,524	2.03	639	1.99	825
23.....	7.75	11,380	8.00	12,300	2.95	2,185	2.48	1,702	1.88	635	1.29	790
24.....	7.35	9,990	7.90	11,930	2.95	2,185	2.63	1,850	1.68	635	0.79	720
25.....	7.20	9,480	8.10	12,680	2.90	2,130	2.13	1,404	1.53	630	0.59	693
26.....	7.50	10,500	7.90	11,930	2.90	2,130	2.09	1,372	1.46	622	0.42	695
27.....	7.35	9,990	7.35	10,050	2.75	1,970	2.14	1,412	1.56	620	0.37	665
28.....	7.50	10,500	7.35	10,050	2.65	1,870	2.29	1,532	1.53	623	0.32	618
29.....	7.35	9,990	7.30	9,900	2.50	1,720	2.34	1,576	1.61	636	0.32	520
30.....	7.70	11,200	7.65	11,020	2.45	1,675	2.39	1,621	1.91	644	1.97	422
31.....	7.75	11,380	7.55	10,680	.....	.....	2.44	1,666	.....	.....	2.71	450 <sup>d</sup>

<sup>b</sup> Open water March 30 to Nov. 2.<sup>d</sup> Ice conditions Nov. 3 to Dec. 31.

## MONTHLY DISCHARGE of Athabaska River at Jasper, for 1915.

(Drainage area 1,600 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	563	494	536	0.335	0.39	32,907
February.....	490	438	463	0.289	0.30	25,714
March.....	437	402	423	0.264	0.30	26,069
April.....	1,430	440	752	0.470	0.52	44,747
May.....	6,360	1,135	3,955	2.472	2.85	243,184
June.....	19,620	4,700	7,960	4.975	5.55	471,420
July.....	13,070	7,230	10,055	6.284	7.24	618,828
August.....	16,220	9,900	12,043	7.577	8.68	740,498
September.....	8,160	1,675	3,430	3.144	2.19	204,190
October.....	2,130	1,279	1,592	0.995	1.15	97,888
November.....	1,500	620	880	0.530	0.61	31,384
December.....	853	422	717	0.448	0.53	44,687
The year.....	.....	.....	.....	.....	30.30	2,603,491



## MALIGNE RIVER NEAR JASPER.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 1, Tp. 46, Rge. 1, W. 6th Mer., about  $4\frac{1}{2}$  miles northeast of Jasper and about 400 feet from the point where the Maligne River enters the Athabaska River.

*Records available.*—Discharge measurements from June 29, 1914, to December 31, 1915. During 1915 gauge heights were obtained at irregular intervals only.

*Gauge.*—Vertical staff, on right bank of river about 250 feet upstream from cable support. Zero elevation of gauge maintained at 91.62 feet since establishment.

*Bench-mark.*—A six-inch spike driven in a 15-inch spruce stump, on right bank of the river, and about 4 feet north of the gauge. Assumed elevation 100.00 feet.

*Channel.*—One channel at all stages, fairly permanent.

*Discharge measurements.*—Made from a cable.

*Winter flow.*—Not affected by ice.

*Observer.*—A. M. Woods.

## DISCHARGE MEASUREMENTS of Maligne River near Jasper, in 1915.

Date.		Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb.	11.	R. J. McGuinness	63	64	1.49	0.40	95
Mar.	19.	J. M. Paul	62	64	1.16	0.36	75
April	28.	do	67	86	1.69	0.83	146
May	18.	do	77	154	3.75	1.99	575
June	4.	do	82	203	5.22	2.70	1,075
June	25.	do	86	243	5.68	3.10	1,379
July	13.	do	87	250	6.36	3.55	1,584
Aug.	2.	do	87	269	6.22	3.26	1,670
Aug.	18.	do	86	247	6.16	3.22	1,522
Sept.	2.	do	86	248	6.39	3.25	1,584
Sept.	23.	do	79	182	4.50	2.41	818
Oct.	7.	do	74	132	3.09	1.74	408
Oct.	27.	do	72	120	2.91	1.57	349
Dec.	15.	do	67	86	1.67	0.70	144

## ROCKY RIVER NEAR HAWES.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 14, Tp. 48, Rge. 28, W. 5th Mer., about three-quarters of a mile east of Hawes station, and about 300 yards from the point where the Rocky River enters the Athabaska River.

*Records available.*—June 9, 1913, to December 31, 1915.

*Gauge.*—Vertical staff on right bank of river and under Grand Trunk Pacific Railway bridge; datum maintained at 3,273.81 feet since establishment.

*Bench-mark.*—On NW. corner of concrete pier and 10 feet from gauge. Elevation 3,282.90 feet. (Grand Trunk Pacific Railway datum.)

*Discharge measurements.*—Made from a bridge.

*Winter flow.*—River affected by ice from November to April. Discharge measurements made at a point about one mile above station.

*Floods.*—Floods occurred from June 26 to 28. The observer was absent at this time so that no actual records are available. It is probable that the maximum gauge height was about 8.50 feet.

*Observer.*—C. Picarell, January 1 to February 6. G. E. Charlesworth, February 7 to September 21. T. Fortin, September 22 to October 7. F. E. Falch, October 11 to December 31.

## DISCHARGE MEASUREMENTS of Rocky River at Hawes, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 21.....	R. J. McGuinness.	200	102	0.16	6.43	16.60
Feb. 9.....	do	200	84	0.08	6.85	6.35
Mar. 13.....	J. M. Paul.	36	33	3.32	5.16	105.00
April 7.....	do	65	40	2.06	4.28	82.00
April 29.....	do	28	33	3.77	4.50	125.00
May 21.....	do	130	169	3.50	5.30	590.00
June 7.....	do	165	251	4.68	5.47	1,176.00
June 30.....	do	209	578	5.75	4.64	3,325.00
July 17.....	do	150	286	6.42	3.93	1,836.00
Aug. 4.....	do	119	232	5.49	2.89	1,274.00
Aug. 21.....	do	119	227	5.20	3.04	1,178.00
Sept. 6.....	do	100	138	4.01	2.26	554.00
Sept. 25.....	do	94	130	3.66	2.12	476.00
Oct. 11.....	do	91	103	3.23	1.85	333.00
Oct. 30.....	do	91	106	3.11	1.80	330.00
Nov. 24.....	do	129	140	1.26	2.40	177.00
Dec. 9.....	do	69	123	0.38	3.42	47.00
Dec. 10.....	do	45	89	0.81	2.27	72.00

## DAILY GAUGE HEIGHT AND DISCHARGE of Rocky River at Hawes, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	6.88	107.0a	7.65	12.00	6.23	63	5.29	100a	4.58	143	5.42d	924
2.....	6.94	108.0	7.69	11.50	5.97	66	5.01	98b	4.62	153	5.44	1,008
3.....	7.02	107.0	7.57	11.40	6.08	71	4.88	96	4.64	158	5.45	1,050
4.....	6.78	107.0	7.57	11.30	6.22	80	4.68	95b	4.66	164	5.55	1,650
5.....	6.27	106.0	7.52	10.20	6.27	88	4.37	93c	4.72	180	5.62	2,070
6.....	5.80	104.0	7.30	9.00	5.85	94	4.29	77	4.88	232	5.65	2,250
7.....	5.73	95.0	7.25	7.90	5.90	98	4.27	74	5.01d	294	5.47	1,170
8.....	6.99	81.0	7.03	7.00	6.10	102	4.24	69	5.14	380	5.45	1,050
9.....	7.14	76.0	7.06	6.35	5.83	104	4.25	71	5.24	488	5.38	782
10.....	7.19	75.0	7.05	7.90	5.92	106	4.22	66	5.31	611	5.36	724
11.....	7.09	74.0	6.98	9.50	5.88	107	4.26d	73	5.21d	452	5.34	674
12.....	7.02	74.0	6.88	11.00	5.02	108	4.29d	77	5.11	356	5.42d	924
13.....	6.85	72.0	6.63	11.80	5.35	108	4.32d	83	5.08	336	5.50	1,350
14.....	5.98	70.0	6.57	13.00	5.16	108	4.35d	89	5.02	300	5.20d	440
15.....	5.89	68.0	6.41	14.80	5.56	108	4.38d	96	4.96	267	4.90	240
16.....	6.21	66.0	6.84	18.00	5.25	108	4.41	102	4.91	244	5.00d	288
17.....	7.02	60.0	7.15	20.00	5.24	107	4.39	98	4.94d	258	5.11	356
18.....	7.20	53.0	6.77	25.00	5.49	107	4.47	116	4.97d	272	4.90	240
19.....	7.23	42.0	7.08	31.00	5.55	106	4.53	130	4.99	283	4.70	174
20.....	7.02	30.0	5.86	40.00	5.51	106	4.51d	125	5.01	294	4.55	135
21.....	6.57	16.6	5.82	44.00	6.08	106	4.48	118	5.25	500	4.60d	148
22.....	6.15	14.9	5.73	48.00	6.04	107	4.46	113	5.21	452	4.66	164
23.....	6.42	14.8	6.12	50.00	6.07	107	4.47d	116	5.24	488	4.69	171
24.....	6.72	14.0	6.32	52.00	5.18	106	4.49	121	5.29d	572	4.68	169
25.....	7.27	13.7	6.26	56.00	4.99	106	4.51	125	5.34d	674	4.82	210
26.....	6.85	13.4	6.53	58.00	5.22	106	4.50	123	5.38	782	5.90d	3,080
27.....	5.95	13.0	6.58	60.00	5.07	105	4.50	123	5.32	632	7.00d	5,954
28.....	5.72	13.0	6.54	61.00	5.01	104	4.49	121	5.32	632	6.20d	4,963
29.....	5.67	12.8			5.51	103	4.49	121	5.32	632	5.40d	3,970
30.....	6.21	12.5			5.53	102	4.55d	135	5.36	724	4.60	2,978
31.....	6.76	12.1			5.55	101			5.39d	811		

a Ice conditions Jan. 1 to April 1.

b Ice breakup April 2 to 4; discharges estimated.

c Open water April 5 to Nov. 6.

d Gauge height interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of Rocky River at Hawes, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.51 <i>d</i>	2,866	2.90	1,050	2.35	613	2.04	433	1.75	298	3.20	86
2.....	4.42 <i>d</i>	2,755	2.90 <i>d</i>	1,050	2.30 <i>d</i>	581	2.01 <i>d</i>	417	1.75	298	4.00	85
3.....	4.33 <i>d</i>	2,643	2.89	1,041	2.26	556	1.98 <i>d</i>	402	1.70	276	3.50	81
4.....	4.23	2,519	2.89	1,041	2.26	556	1.96	393	1.67	263	3.45	78
5.....	4.18 <i>d</i>	2,457	2.78	944	2.26	556	1.85	342	1.66	258	3.38 <i>d</i>	74
6.....	4.14	2,408	2.70	876	2.26	556	1.82 <i>d</i>	329	1.66	258 <i>c</i>	3.30	73
7.....	4.16 <i>d</i>	2,432	2.68	860	2.25	550	1.80	320	1.65	258 <i>b</i>	3.35	72
8.....	4.18	2,457	2.66	843	2.25 <i>d</i>	550	1.82 <i>d</i>	329	1.65	257 <i>a</i>	3.25	72
9.....	4.14	2,408	2.62 <i>d</i>	811	2.25	550	1.84 <i>d</i>	338	1.65	255	3.45	73
10.....	4.14	2,408	2.58	779	2.26	556	1.85 <i>d</i>	342	1.62	246	3.48 <i>d</i>	72
11.....	3.98	2,216	2.56 <i>d</i>	764	2.26 <i>d</i>	556	1.85	342	1.63	238	3.50	72
12.....	4.05	2,300	2.54	748	2.26	556	1.85	342	1.75	227	3.90	70
13.....	4.11	2,372	2.52	733	2.21 <i>d</i>	527	1.82	329	1.80	221	4.10	68
14.....	4.10 <i>d</i>	2,360	2.50 <i>d</i>	717	2.16	499	1.78	311	2.05	216	3.60	67
15.....	4.10	2,360	2.47	695	2.13 <i>d</i>	482	1.76	302	2.20	211	3.10	67
16.....	4.10	2,360	2.47	695	2.10	465	1.76	302	2.35	208	3.30	63
17.....	3.93	2,155	2.46	688	2.10	465	1.76	302	2.30	207	3.25	61
18.....	3.92	2,144	2.90 <i>d</i>	1,050	2.18 <i>d</i>	510	1.70	316	2.25	206	3.20	61
19.....	3.91	2,132	3.34	1,487	2.26	556	1.82	329	2.25	205	3.25	60
20.....	3.90	2,120	3.26	1,402	2.26 <i>d</i>	556	1.79	316	2.25	202	3.28	60
21.....	3.78 <i>d</i>	1,981	3.00	1,144	2.25	550	1.78	311	2.25	200	3.75	59
22.....	3.66	1,842	2.86	1,015	2.24 <i>d</i>	544	1.76	302	2.45	195	3.50	56
23.....	3.52	1,682	2.78 <i>d</i>	944	2.22 <i>d</i>	533	1.75	298	2.35	188	3.25	54
24.....	3.42	1,574	2.69	868	2.21 <i>d</i>	527	1.75	298	2.50	177	3.25	47
25.....	3.34	1,487	2.64	827	2.20	521	1.78	311	2.45	162	2.85 <i>d</i>	43
26.....	3.20	1,340	2.65	835	2.15 <i>d</i>	493	1.78	311	2.50	150	2.45	38
27.....	3.16	1,300	2.64	827	2.10 <i>d</i>	465	1.80	320	2.55	133	1.50	30
28.....	3.11 <i>d</i>	1,250	2.54 <i>d</i>	748	2.06	443	1.86	347	3.00	110	1.60	26
29.....	3.06	1,202	2.45	681	2.05 <i>d</i>	438	1.84	338	4.30	95	1.50	23
30.....	3.00	1,144	2.44	674	2.05 <i>d</i>	438	1.80	320	3.45	87	1.40	20
31.....	2.95 <i>d</i>	1,097	2.40 <i>d</i>	646	.....	.....	1.78	311	.....	.....	1.50	17 <i>a</i>

a Ice conditions Nov. 8 to Dec. 31.

b Ice forming Nov. 7.

c Open water April 5 to Nov. 6.

d Gauge height interpolated.

## MONTHLY DISCHARGE of Rocky River at Hawes, for 1915.

(Drainage area 428 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	108	12.10	56	0.131	0.15	3,443
February.....	61	6.35	26	0.061	0.06	1,444
March.....	108	63.00	100	0.234	0.27	6,149
April.....	135	66.00	101	0.236	0.26	6,010
May.....	811	143.00	412	0.963	1.11	25,333
June.....	5,954	135.00	1,310	3.061	3.41	77,950
July.....	2,866	1,097.00	2,057	4.806	5.54	126,480
August.....	1,487	646.00	887	2.072	2.39	54,540
September.....	613	438.00	525	1.227	1.37	31,240
October.....	433	298.00	332	0.776	0.89	20,414
November.....	298	87.00	210	0.491	0.55	12,496
December.....	86	17.00	59	0.138	0.16	3,628
The year.....	.....	.....	.....	.....	16.16	369,127

## SESSIONAL PAPER No. 25c

## ATHABASKA RIVER NEAR HINTON.

*Location.*—In the SE  $\frac{1}{4}$  Sec. 8, Tp. 51, Rge. 25, W. 5th Mer., about three miles west of the town of Hinton, and just below the mouth of Prairie Creek.

*Records available.*—Gauge heights and discharge measurements available from May 4, 1915, to December 31, 1915.

*Gauges.*—The summer gauge is a vertical staff on the left bank of the river and about 800 feet below the cable; datum maintained at 3,144.13 feet since establishment. The winter gauge is a vertical staff on the right bank of the river, just above the mouth of Happy Creek, and about three miles below the summer gauge; datum maintained at 86.55 feet since establishment.

*Bench-marks.*—For the summer gauge a permanent iron bench-mark is located on the left bank of the river and about 15 feet from the gauge; elevation 3,154.02 feet. (Grand Trunk Pacific Railway datum.) For the winter gauge a six-inch spike in a spruce stump on the right bank and about 50 feet upstream from the gauge; assumed elevation 100.00 feet

*Discharge measurements.*—Made from a cable.

*Winter flow.*—River affected by ice from November to April. Discharge measurements made about three miles below the station.

*Floods.*—Floods occurred from June 26 to 30. The river overflowed its right bank at the station but no damage was done. The maximum gauge height was 10.70 feet and the maximum discharge 40,100 second-feet.

*Observer.*—J. R. McNeely, May 4 to November 12. L. O. Hoff, November 13 to December 31.

## DISCHARGE MEASUREMENTS of Athabaska River near Hinton, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 10.....	J. M. Paul.....	280	664	0.68	.....b	449
May 5.....	do.....	253	1,390	2.00	1.29	2,773
May 24.....	do.....	361	2,246	4.47	3.95	10,011
June 11.....	do.....	363	2,280	4.69	3.98	10,699
June 27.....	do.....	433	5,177	5.80	11.56	32,461 <sup>a</sup>
July 3.....	do.....	378	3,282	6.60	6.42	21,649
July 19.....	do.....	377	3,207	6.25	6.33	20,048
Aug. 7.....	do.....	372	2,937	6.05	5.63	17,783
Aug. 23.....	do.....	367	2,957	6.03	5.74	17,839
Sept. 8.....	do.....	353	2,201	4.43	3.67	9,745
Sept. 27.....	do.....	286	1,621	2.70	1.86	4,371
Oct. 13.....	do.....	256	1,413	2.17	1.30	3,072
Nov. 1.....	do.....	255	1,404	2.19	1.24	3,075
Nov. 18.....	do.....	253	1,390	1.99	1.28	2,759 <sup>a</sup>
Dec. 8.....	do.....	220	1,072	1.17	4.17	1,258

<sup>a</sup> Slope measurement.

<sup>b</sup> Gauge not established.

## DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska River near Hinton, for 1915.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3.10	7.375	8.70	31,220	5.61	17,479
2			3.50	8,760	6.70	22,320	5.73	18,007
3			3.70	9,500	6.40	20,985	5.81	18,360
4	1.10	2,820	3.70	9,500	6.10	19,650	6.51	21,474
5	1.30	3,115	3.80	9,880	5.95	18,982	6.09	19,606
6	1.50	3,430	4.05	10,860	6.25	20,318	5.79	18,271
7	2.30	5,060	3.95	10,462	6.55	21,652	5.62	17,523
8	3.00	7,050	4.30	11,865	6.70	22,320	5.71	17,919
9	3.50	8,760	4.20	11,460	6.30	20,540	5.69	17,531
10	3.70	9,500	3.90	10,265	6.10	19,650	5.67	17,743
11	4.00	10,660	3.75	9,690	6.12	19,739	5.61	17,479
12	3.80	9,880	3.85	10,072	5.71	17,919	5.56	17,259
13	3.20	7,710	4.00	10,660	5.73	18,007	5.47	16,863
14	2.90	6,730	4.15	11,260	6.11	19,694	5.45	16,775
15	2.80	6,420	4.20	11,460	6.56	21,697	5.53	17,127
16	2.70	6,125	4.50	12,695	6.88	23,121	5.58	17,347
17	2.20	4,825	5.15	15,475	6.90	23,210	5.67	17,743
18	2.20	4,825	5.55	17,215	6.71	22,364	5.89	18,716
19	2.40	5,310	5.05	15,045	6.21	20,140	6.26	20,362
20	2.70	6,125	4.80	13,970	6.06	19,472	6.25	20,318
21	3.30	8,050	4.85	14,185	5.97	19,072	.02	19,294
22	3.90	10,265	4.80	13,970	6.06	19,472	5.90	18,760
23	4.10	11,060	4.95	14,615	6.12	19,739	5.74	18,051
24	3.90	10,265	5.20	15,690	5.91	18,804	5.70	17,875
25	3.90	10,265	5.45	16,775	5.70	17,875	5.67	17,743
26	3.80	9,880	7.55	26,102	5.61	17,479	5.63	17,567
27	3.70	9,500	10.55	39,586	5.54	17,171	5.35	16,338
28	3.50	8,760	10.70	40,120	5.43	16,687	5.14	15,432
29	3.50	8,760	10.04	37,183	5.40	16,555	5.06	15,088
30	3.40	8,400	9.58	35,136	5.50	16,995	5.31	16,164
31	3.30	8,050			5.53	17,127	5.35	16,338

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska River near Hinton, for 1915.—*Concluded.*

DAY.	September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5.01	14,873	1.74	3,856	1.27	3,070	3.70	1,810
2	4.44	12,443	1.78	3,932	1.14	2,878	3.89	1,740
3	4.28	11,784	1.82	4,010	1.08	2,792	4.04	1,640
4	4.20	11,460	1.77	3,913	1.01	2,694	4.16	1,525
5	4.30	11,865	1.70	3,780	0.91	2,558	4.22	1,430
6	4.32	11,947	1.62	3,638	0.83	2,450	4.33	1,340
7	4.14	11,220	1.50	3,430	0.81	2,124	4.19	1,250
8	3.60	9,125	1.50	3,430	0.73	2,319	4.17	1,260
9	3.49	8,724	1.48	3,398	0.70	2,280	4.30	1,225
10	3.01	7,082	1.44	3,334	0.67	2,244	4.42	1,200
11	2.96	6,922	1.30	3,115	0.62	2,184	4.33	1,180
12	2.80	6,420	1.19	2,950	0.51	2,056	4.30	1,170
13	2.74	6,243	1.28	3,085	1.25	2,140a	4.24	1,165
14	2.61	5,868	1.20	2,965	1.34	2,290	4.37	1,150
15	2.36	5,210	1.11	2,834	1.79	2,475	4.43	1,140
16	2.34	5,160	1.00	2,680	2.03	2,610	4.41	1,110
17	2.33	5,135	0.97	2,640	2.17	2,720	4.36	1,080
18	2.30	5,060	1.09	2,806	2.38	2,759	4.55	1,060
19	2.38	5,260	1.18	2,936	2.55	2,750	4.45	1,060
20	2.41	5,336	1.28	3,055	2.43	2,730	4.40	1,060
21	2.54	5,678	1.31	3,130	2.34	2,690	4.56	1,050
22	2.40	5,310	1.27	3,070	2.56	2,620	4.43	1,030
23	2.21	4,848	1.18	2,936	2.75	2,530	4.57	1,010
24	2.15	4,712	1.11	2,834	2.91	2,325	4.34	990
25	2.11	4,622	1.09	2,806	3.09	2,050	4.39	970
26	2.18	4,780	1.05	2,750	3.01	1,975	4.32	970
27	1.86	4,090	1.09	2,806	3.07	1,940	4.27	970
28	1.79	3,951	1.13	2,864	3.19	1,920	4.08	970
29	1.74	3,856	1.27	3,070	3.17	1,900	4.08	950
30	1.72	3,818	1.30	3,115	3.32	1,860	3.72	930
31			1.19	2,950			3.60	900a

a to a Ice conditions Nov. 13 to Dec. 31.

## MONTHLY DISCHARGE of Athabaska River near Hinton, for 1915.

(Drainage area 4,140 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (4-31)	11,060	2,820	7,557	1.825	1.90	419,695
June	40,120	7,375	16,028	3.871	4.32	953,732
July	31,220	16,555	19,999	4.831	5.57	1,229,690
August	21,474	15,088	17,834	4.308	4.97	1,096,570
September	14,873	3,818	7,093	1.713	1.91	422,063
October	4,010	2,640	3,166	0.765	0.88	194,670
November	3,070	1,860	2,408	0.582	0.65	143,286
December	1,810	900	1,173	0.283	0.33	72,125
The period					20.53	4,531,831

## MCLEOD RIVER NEAR THORNTON.

*Location.*—On the NW  $\frac{1}{4}$  Sec. 3, Tp. 54, Rge. 16, W. 5th Mer., at the Thornton ferry, about one mile downstream from the mouth of Wolf Creek, and about 200 feet south of E. Smith's ranch buildings.

*Records available.*—Gauge heights available from May 18, 1914, to December 31, 1915. Discharge measurements available from September 26, 1913, to December 31, 1915.

*Gauge.*—Vertical staff for high water and slope gauge for low water, directly under the ferry cable, on the right bank of the river. Datum maintained at 2,737.64 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on the right bank and about 50 feet upstream from gauge. Elevation 2,749.16 feet. (Grand Trunk Pacific Railway datum.)

*Channel.*—One channel at all stages, fairly permanent.

*Discharge measurements.*—Made from a cable car and by wading.

*Winter flow.*—Stream affected by ice from November to April. Discharge measurements are made at a point about 1000 feet above regular station.

*Floods.*—Floods occurred from June 27 to 29, the maximum gauge height being 14.13 feet. The river did not overflow its banks at the station. The maximum discharge was 23,850 second-feet.

*Observer.*—Edward Smith.

### DISCHARGE MEASUREMENTS of McLeod River near Thornton, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 14.	R. J. McGuinness	120	118.0	0.83	1.46	98
Feb. 3.	do	100	96.5	1.14	1.51	110
Mar. 9.	J. M. Paul	68	62.0	1.32	1.59	82
April 5.	do	197	547.5	0.72	2.40	394
April 21.	do	273	508.8	1.39	1.70	709
May 7.	do	285	620.2	1.76	2.10	1,093
May 27.	do	307	856.6	2.23	3.02	1,916
June 12.	do	367	2,041.0	4.04	6.02	8,255
June 27.	do	420	5,096.0	4.70	14.13	23,850
July 5.	do	345	1,409.0	3.03	4.61	4,282
July 22.	do	365	2,193.4	4.28	6.53	9,389
Aug. 9.	do	306	813.0	1.95	2.80	1,586
Aug. 25.	do	309	846.4	1.99	2.91	1,684
Sept. 14.	do	285	585.0	1.64	2.08	958
Sept. 29.	do	287	644.6	1.55	2.16	1,028
Oct. 19.	do	282	581.6	1.54	2.02	895
Nov. 5.	do	273	513.8	1.22	1.84	627
Nov. 16.	do	275	566.0	0.90	2.01	509
Dec. 4.	do	136	267.0	0.63	1.64	168
Dec. 29.	R. J. McGuinness	120	215.0	0.79	2.04	169

### DAILY GAUGE HEIGHT AND DISCHARGE of McLeod River near Thornton, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	1.10	130a	1.52	108	1.48	109	2.13	261	1.50	560	3.10	1,930
2.	1.11	140	1.52	108	1.48	112	2.13	293	1.60	620	3.20	2,050
3.	1.12	149	1.52	110	1.48	100	2.12	326	1.60	620	4.50	4,040
4.	1.23	150	1.52	119	1.48	86	2.11	359	1.80	760	4.80	4,620
5.	1.24	149	1.52	128	1.58	82	2.40	394	2.30	1,150	4.30	3,680
6.	1.26	140	1.52	132	1.58	81	2.41	430	2.30	1,150	4.10	3,340
7.	1.28	112	1.52	130	1.58	81	1.62	490	2.10	990	4.00	3,170
8.	1.30	122	1.52	118	1.58	81	2.68	555	2.10	990	4.00	3,170
9.	1.32	130	1.51	106	1.57	82	1.84	625	2.10	990	4.80	4,620
10.	1.34	131	1.51	102	1.57	83	2.26	695b	2.10	990	6.20	8,410
11.	1.36	130	1.51	103	1.56	88	1.77	735	2.10	990	6.30	8,740
12.	1.38	125	1.51	110	1.56	95	1.79	753	2.10	990	6.00	7,750
13.	1.40	115	1.51	118	1.65	103	1.70	690	2.00	910	5.60	6,560
14.	1.42	98	1.51	128	1.65	113	1.72	704	2.10	990	5.50	6,290
15.	1.42	101	1.51	138	1.64	124	1.84	788	2.30	1,150	5.20	5,520
16.	1.42	107	1.50	142	1.73	135	1.75	725	2.30	1,150	5.20	5,520
17.	1.42	125	1.50	135	1.73	145	1.67	669	2.40	1,240	5.50	6,290
18.	1.42	147	1.50	85	1.72	155	1.68	676	2.50	1,150	6.00	7,750
19.	1.42	146	1.50	81	1.72	160	1.69	683	2.20	1,070	5.60	6,560
20.	1.42	135	1.50	90	1.71	162	1.69	683	2.10	990	5.10	5,280
21.	1.52	123	1.50	93	1.80	163	1.70	690	2.00	910	4.90	4,830
22.	1.52	114	1.50	95	1.90	162	1.50	560	2.00	910	4.50	4,040
23.	1.52	110	1.49	96	2.09	160	1.40	500	2.20	1,070	4.30	3,680
24.	1.52	109	1.49	96	2.19	151	1.30	440	2.40	1,240	4.10	3,340
25.	1.52	108	1.49	90	2.18	142	1.30	440	2.80	1,610	4.10	3,340
26.	1.52	107	1.49	82	2.27	143	1.40	500	2.80	1,610	5.90	7,430
27.	1.52	107	1.49	84	2.27	151	1.40	500	3.00	1,820	13.86	33,688
28.	1.52	107	1.49	98	2.26	167	1.40	500	2.50	1,610	11.40	25,570
29.	1.52	107	.....	.....	2.26	185	1.40	500	2.70	1,510	7.90	14,920
30.	1.52	106	.....	.....	2.15	210	1.40	500	2.70	1,510	6.90	10,720
31.	1.52	107	.....	.....	2.14	235	.....	.....	3.00	1,820	.....	.....

a to b Ice conditions.



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of McLeod River near Thornton, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.40	9,070	3.70	2,710	2.30	1,150	2.20	1,070	1.80	760a	1.70	200
2.....	5.90	7,430	3.50	2,430	2.20	1,070	2.30	1,150	1.50	550	1.70	182
3.....	5.20	5,520	3.40	2,300	2.10	990	2.40	1,240	1.30	390	1.70	171
4.....	4.70	4,420	3.30	2,170	2.00	910	2.70	1,510	1.80	680	1.70	168
5.....	4.60	4,230	3.20	2,050	2.00	910	2.70	1,510	1.80	627	1.70	168
6.....	4.50	4,040	3.10	1,930	1.90	830	2.60	1,420	1.80	610	1.72	168
7.....	4.30	3,680	3.00	1,820	1.90	830	2.50	1,330	1.50	584	1.72	168
8.....	4.50	4,040	2.90	1,710	1.90	830	2.40	1,240	1.40	541	1.72	168
9.....	4.30	3,680	2.80	1,610	1.90	830	2.40	1,240	1.20	500	1.82	168
10.....	4.50	4,040	2.80	1,610	1.90	830	2.30	1,150	0.80	478	1.82	168
11.....	8.50	16,000	2.70	1,510	1.90	830	2.30	1,150	1.00	470	1.84	168
12.....	8.40	15,670	2.60	1,420	2.00	910	2.30	1,150	1.20	470	1.84	168
13.....	7.60	13,030	2.50	1,330	2.10	990	2.20	1,070	1.20	475	1.84	168
14.....	7.40	12,370	2.40	1,240	2.10	990	2.20	1,070	1.40	453	1.94	168
15.....	11.90	27,220	2.40	1,240	2.10	990	2.10	990	1.80	496	1.94	168
16.....	11.00	24,250	2.40	1,240	2.20	1,070	2.10	990	2.00	509	1.96	168
17.....	11.35	25,405	2.30	1,150	2.40	1,240	2.00	910	2.10	520	1.96	169
18.....	10.30	21,940	2.30	1,150	2.40	1,240	2.00	910	2.20	526	1.96	169
19.....	8.50	16,000	3.00	1,820	2.40	1,240	2.00	910	2.10	526	1.96	169
20.....	7.60	13,030	4.60	4,230	2.50	1,330	2.00	910	2.10	520	1.96	169
21.....	6.90	10,720	4.20	3,510	2.60	1,420	2.00	910	2.10	495	1.98	169
22.....	6.50	9,400	3.70	2,710	2.50	1,330	2.00	910	2.10	490	1.98	169
23.....	6.30	8,740	3.30	2,170	2.40	1,240	2.00	910	2.00	492	1.98	169
24.....	6.10	8,080	3.10	1,930	2.40	1,240	2.00	910	2.00	490	1.98	169
25.....	5.60	6,560	2.90	1,710	2.30	1,150	2.00	910	2.00	471	1.98	169
26.....	5.10	5,280	2.80	1,610	2.30	1,150	2.00	910	1.90	433	2.00	169
27.....	4.70	4,420	2.70	1,510	2.30	1,150	1.90	830	1.90	380	2.00	169
28.....	4.40	3,860	2.60	1,420	2.20	1,070	1.90	830	1.90	305	2.00	169
29.....	4.10	3,340	2.50	1,330	2.20	1,070	1.90	830	1.80	260	2.00	169
30.....	3.90	3,010	2.50	1,330	2.20	1,070	1.90	830	1.80	225	2.00	165
31.....	3.80	2,860	2.40	1,240	.....	.....	1.90	830	.....	.....	2 00	162b

a to b Ice conditions.

## MONTHLY DISCHARGE of McLeod River near Thornton, for 1915.

(Drainage area 2,507 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	150	98	122	0.049	0.06	7,501
February.....	142	81	108	0.043	0.04	5,908
March.....	235	81	131	0.052	0.06	8,085
April.....	788	261	356	0.222	0.25	33,084
May.....	1,820	560	1,131	0.451	0.52	69,542
June.....	33,688	1,930	7,198	2.871	3.20	428,306
July.....	27,220	2,860	9,720	3.877	4 47	597,690
August.....	4,230	1,150	1,843	0.735	0 85	113,324
September.....	1,420	830	1,063	0 424	0 47	63,252
October.....	1,510	830	1,050	0 419	0 48	61,560
November.....	760	225	492	0 196	0 22	39,276
December.....	200	162	170	0 068	0 08	10,453
The year.....	.....	.....	.....	.....	10 18	1,431,011

## LOBSTICK RIVER NEAR ENTWISTLE.

*Location.*—On the NE 4 Sec. 30, Tp. 53, Rge. 7, W. 5th Mer., about 2½ miles northwest of the village of Entwistle.

*Records available.*—Gauge heights available from July 11, 1913, to December 31, 1915. Discharge measurements available from February 20, 1913, to December 31, 1915.

*Gauge.*—Vertical staff at right bank and spiked to downstream side of bridge; elevation of zero maintained at 2,366.19 since establishment.

*Bench-mark.*—Permanent iron bench-mark, on right bank of river and about 60 feet west of the gauge. Elevation 2,375.14 feet. (Grand Trunk Pacific railway datum.)

*Channel.*—Fairly permanent.

*Discharge measurements.*—Made from a bridge.

*Winter flow.*—River affected by ice from November to April and discharge measurements are made at a point about 700 feet downstream from regular section.

*Observer.*—Edward Reed.

### DISCHARGE MEASUREMENTS of Lobstick River near Entwistle, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Fert.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 9	P. H. Daniells	45	52.5	1.49	1.80	78.0
Feb. 2	R. J. McGuinness	33	25.7	0.93	1.04	24.0
Mar. 6	do	15	7.5	1.02	0.88	17.0
April 3	J. M. Paul	56	68.8	2.34	2.82	161.0
April 20	do	47	66.6	1.10	1.37	73.0
May 8	do	46	54.2	1.02	1.12	55.0
May 28	do	48	35.4	1.40	1.04	49.0
June 14	do	81	162.7	3.47	2.54	565.0
July 6	do	82	86.4	2.07	1.70	178.0
July 24	do	82	136.8	3.42	2.34	469.0
Aug. 10	do	82	96.6	2.39	1.84	230.0
Aug. 26	do	82	79.6	1.78	1.62	142.0
Sept. 11	do	82	83.6	1.71	1.53	143.0
Sept. 30	do	82	70.2	1.46	1.44	103.0
Oct. 16	do	89	62.9	1.38	1.37	87.0
Nov. 2	T. H. Burt	89	158.8	1.36	3.16	215.0
Dec. 13	J. M. Paul	89	90.3	0.59	3.08	53.0
Dec. 19	do	89	75.0	0.29	1.37	22.0

### DAILY GAUGE HEIGHT AND DISCHARGE of Lobstick River near Entwistle, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2.60	56	0.98 <sup>a</sup>	24	0.88	11	2.58	120	1.30	82	1.10	56
2	2.50	58	0.98	24	0.88	10	2.68	140	1.40	99	1.20	68
3	2.42 <sup>a</sup>	61	0.98	24	0.88	9	2.68	161	1.40	99	1.40	99
4	2.34 <sup>a</sup>	64	0.98	24	0.88	9	2.58	166	1.30	82	1.40	99
5	2.25 <sup>a</sup>	68	1.08	24	0.88	8	2.28	178	1.30	82	1.70	168
6	2.16 <sup>a</sup>	72	1.08	24	0.88	8	3.08	180	1.30	82	1.90	235
7	2.07 <sup>a</sup>	76	0.98	24	0.88	8	2.96 <sup>a</sup>	178	1.30	82	2.00	280
8	1.98 <sup>a</sup>	75	0.98	24	0.88	8	2.84 <sup>a</sup>	171	1.20	68	2.50	552
9	1.89 <sup>a</sup>	78	0.98	25	0.88	9	2.72 <sup>a</sup>	163	1.20	68	2.80	723
10	1.80	77	0.98	25	0.88	9	2.60 <sup>a</sup>	154	1.20	68	2.80	723
11	1.70	78	0.88	25	0.98	10	2.48 <sup>a</sup>	146	1.20	68	2.60	609
12	1.70	76	0.88	26	0.98	11	2.36 <sup>a</sup>	138	1.30	82	2.70	666
13	1.60	73	0.88	26	0.98	11	2.24 <sup>a</sup>	130	1.30	82	2.60	609
14	1.60	73	0.88	26	0.98	12	2.12 <sup>a</sup>	122	1.30	82	2.50	552
15	1.50	72	0.88	25	0.98	13	2.00 <sup>a</sup>	114	1.20	68	2.40	495
16	1.50	73	0.88	25	0.98	14	1.88 <sup>a</sup>	228	1.20	68	2.20	383
17	1.60	74	0.88	24	1.08	16	1.76 <sup>a</sup>	186	1.10	56	2.20	383
18	2.00	76	0.88	23	1.08	17	1.64 <sup>a</sup>	152	1.10	56	2.20	383
19	2.10	77	0.88	22	1.08	19	1.52 <sup>a</sup>	124	1.10	56	2.10	330
20	2.10	77	0.88	21	1.08	21	1.40	99	1.10	56	2.10	330
21	2.20	76	0.88	20	2.23 <sup>a</sup>	23	1.40	99	1.09	46	2.20	383
22	1.60	71	0.88	18	3.38 <sup>b</sup>	26	1.60	142	1.00	46	2.00	280
23	1.50	60	0.88	17	3.18	30	1.60	142	1.00	46	2.10	330
24	1.60	52	0.88	16	2.88	34	1.50	119	1.00	46	2.00	280
25	1.50	47	0.78	15	3.98	40	1.70	168	1.00	46	2.00	280
26	1.50	42	0.78	14	3.66 <sup>c</sup>	46	1.50	119	1.30	82	2.00	280
27	1.30	36	0.78	13	3.33 <sup>c</sup>	58	1.60	142	1.10	56	2.00	280
28	1.00	29	0.88	12	3.00 <sup>c</sup>	68	1.50	119	1.00	46	2.00	280
29	1.00	26			2.68	80	1.50	119	1.00	46	2.00	280
30	0.99 <sup>a</sup>	25			2.68	90	1.40	99	1.20	68	2.00	280
31	0.99 <sup>a</sup>	25			2.58	105			1.30	82		

<sup>a</sup> Gauge height interpolated.

<sup>b</sup> Ice breaking up March 22.

<sup>c</sup> March 26 to 28, ice about gauge; gauge heights interpolated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Lobstick River near Entwistle, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1. ....	2.00	280	1.80	198	1.60	142	1.40	99	1.10	56	3.19	65
2. ....	1.80	198	1.80	198	1.55	139	1.40	99	1.10	56	2.79	59
3. ....	1.70	168	1.80	198	1.50	119	1.40	99	1.10	56	3.10	53
4. ....	1.70	168	1.80	198	1.50	119	1.40	99	1.10	56	2.60	50
5. ....	1.70	168	1.80	198	1.50	119	1.40	99	1.30	82	2.60	46
6. ....	1.70	168	1.80	198	1.50	119	1.40	99	1.50	118	2.40	43
7. ....	1.70	168	1.70	168	1.50	119	1.40	99	1.50	118	2.40	39
8. ....	1.70	168	1.70	168	1.50	119	1.40	99	1.50	118	2.10	35
9. ....	1.70	168	1.70	168	1.50	119	1.40	99	1.60	141	2.10	32
10. ....	1.80	198	1.80	198	1.50	119	1.50	119	1.80	160a	2.10	30
11. ....	1.80	198	1.80	198	1.50	119	1.50	119	1.80	185	2.10	27
12. ....	2.00	280	1.80	198	1.50	119	1.40	99	3.16	214	1.60	25
13. ....	2.00	280	1.80	198	1.50	119	1.40	99	2.00	221	1.90	24
14. ....	2.10	330	1.80	198	1.60	142	1.40	99	3.80	226	1.70	24
15. ....	2.50	552	1.80	198	1.60	142	1.40	99	3.80	227	1.60	23
16. ....	2.60	609	1.70	168	1.50	119	1.40	99	4.00	226	1.60	22
17. ....	2.60	609	1.70	168	1.50	119	1.40	99	3.70	225	1.60	22
18. ....	2.50	552	1.70	168	1.50	119	1.40	99	3.70	222	1.60	22
19. ....	2.50	552	1.70	168	1.50	119	1.40	99	3.70	217	1.40	22
20. ....	2.50	552	1.70	168	1.40	99	1.40	99	3.60	210	1.40	23
21. ....	2.30	438	1.70	168	1.40	99	1.40	99	3.63	200	1.50	25
22. ....	2.30	438	1.70	168	1.40	99	1.40	99	3.63	191	1.60	28
23. ....	2.30	438	1.60	142	1.40	99	1.40	99	3.73	180	1.60	30
24. ....	2.30	438	1.60	142	1.40	99	1.40	99	3.73	165	1.60	32
25. ....	2.30	438	1.60	142	1.40	99	1.40	99	3.73	147	1.60	32
26. ....	2.30	438	1.60	142	1.40	99	1.40	99	3.76	125	1.60	33
27. ....	2.10	330	1.60	142	1.40	99	1.30	82	3.76	110	1.60	33
28. ....	2.10	330	1.50	119	1.40	99	1.30	82	3.56	95	1.50	32
29. ....	2.00	280	1.50	119	1.40	99	1.30	82	3.66	85	1.40	31
30. ....	1.80	198	1.50	119	1.40	99	1.30	82	3.06	75	1.30	29
31. ....	1.80	198	1.60	142	.....	.....	1.20	68	.....	.....	1.20	27a

a to a Ice conditions Nov. 10 to Dec. 31.

## MONTHLY DISCHARGE of Lobstick River near Entwistle, for 1915.

(Drainage area 718 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January . . .	78	25	62	0.0864	0.10	3,812
February . .	26	12	22	0.0305	0.03	1,222
March . . .	105	8	27	0.0376	0.04	1,660
April . . .	228	99	144	0.2000	0.22	8,569
May . . .	99	46	68	0.0947	0.11	4,181
June . . .	723	56	357	0.4960	0.55	21,243
July . . .	609	168	333	0.4640	0.53	20,475
August . . .	198	119	170	0.2370	0.27	10,452
September .	142	99	114	0.1580	0.18	6,783
October . .	119	68	97	0.1380	0.16	5,644
November .	227	56	150	0.2080	0.23	8,928
December .	65	22	33	0.0160	0.03	2,029
The year . .					2.47	95,316

## PEMBINA RIVER NEAR ENTWISTLE.

*Location.*—On the SW  $\frac{1}{4}$  Sec. 20, Tp. 53, Rge. 7, W. 5th Mer., directly under the Grand Trunk Pacific railway trestle about  $1\frac{1}{2}$  miles west of the Entwistle station.

*Records available.*—Gauge heights available from May 8, 1914, to December 31, 1915. Discharge measurements available from December 19, 1913, to December 31, 1915.

*Gauge.*—Vertical staff, spiked to pile about 20 feet downstream from the cable and 20 feet from the right bank. Datum maintained at 2,348.06 feet.

*Bench-mark.*—Permanent iron bench-mark on the right bank and 20 feet west of cable tower.

*Elevation.*—2,364.60 feet. (Grand Trunk Pacific railway datum.)

*Channel.*—One channel at all stages, fairly permanent.

*Discharge measurements.*—Made from a cable car.

*Winter flow.*—River affected by ice from November to April; discharge measurements made at a point about 1500 feet above regular station.

*Floods.*—Two floods occurred in 1915, one in June and a small one in July. On June 29 the maximum gauge height was 10.50 feet and the maximum discharge 10,763 second-feet. The second flood occurred on July 17 and carried away the pile on which the temporary bench-mark was placed. Neither flood did any damage.

*Observer.*—Fred. Williams, January 1 to September 30, 1915. Edward Reed, October 14 to December 31, 1915.

## DISCHARGE MEASUREMENTS of Pembina River near Entwistle, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 9. ....	P. H. Daniells. ....	84	164.0	0.33	0.94	54.0
Feb. 2. ....	R. J. McGuinness. ....	90	145.0	0.06	1.18	8.7
Mar. 6. ....	do	145	259.0	0.17	1.15	44.0
April 3. ....	J. M. Paul. ....	150	255.5	1.64	1.88	420.0
April 20. ....	do	149	522.7	0.83	1.47	433.0
May 8. ....	do	153	574.6	0.91	1.60	526.0
May 28. ....	do	152	580.4	1.21	1.83	702.0
June 14. ....	do	176	1,271.0	4.11	5.35	5,204.0
June 29. ....	do	190	2,184.0	4.93	10.50	10,763.0
July 6. ....	do	166	884.0	2.55	3.50	2,255.0
July 23. ....	do	163	1,143.0	3.54	5.03	4,045.0
Aug. 10. ....	P. M. Sauder and J. M. Paul. ....	156	634.0	1.26	1.95	798.0
Aug. 26. ....	J. M. Paul. ....	155	588.8	1.14	1.74	671.0
Sept. 11. ....	do	152	505.0	0.71	1.16	358.0
Sept. 30. ....	do	152	539.0	0.75	1.26	404.0
Oct. 16. ....	do	152	533.5	0.85	1.40	453.0
Nov. 15. ....	T. H. Burt. ....	145	453.5	0.26	1.60	117.0
Dec. 3. ....	J. M. Paul. ....	91	180.0	0.45	1.84	81.0
Dec. 19. ....	do	81	177.0	0.47	1.45	84.0

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Pembina River near Entwistle, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.90	48 <sup>b</sup>	1.28	12	1.18	39	1.00	126 <sup>b</sup>	1.30	328	3.00	1,780
2.....	0.90	52	1.28	9	1.18	40	1.50	222 <sup>c</sup>	1.30	328	3.00	1,780
3.....	0.90	55	1.28	11	1.18	41	1.90	318	1.30	328	3.00	1,780
4.....	0.90	56	1.27	15	1.17	42	2.00	413	1.30	328	3.10	1,590
5.....	0.90	57	1.27	19	1.17	43	2.30	508	1.30	328	3.20	2,000
6.....	1.00	56	1.26	21	1.17	44	2.49	603	1.40	385	3.30	2,120
7.....	1.00	52	1.26	24	1.17	45	2.39	698	1.60	522	3.20	2,000
8.....	1.00	50	1.26	25	1.17	46	2.39	793	1.60	522	3.10	1,890
9.....	1.00	54	1.25	28	1.17	48	2.38	888 <sup>c</sup>	1.50	452	4.20	3,335
10.....	1.00	57	1.25	30	1.17	49	2.18	983	1.40	385	5.80	5,970
11.....	1.00	59	1.24	32	1.17	50	2.07	890	1.30	328	5.80	5,970
12.....	1.00	58	1.24	33	1.17	52	1.97	807	1.20	275	5.70	5,795
13.....	1.00	57	1.23	35	1.17	54	1.87	726	1.10	230	5.60	5,620
14.....	1.00	54	1.23	35	1.17	56	1.76	641	1.10	230	5.30	5,110
15.....	1.00	47	1.23	35	1.17	58	1.66	566	1.10	230	5.00	4,605
16.....	1.02	42	1.22	34	1.18	60	1.55	487	1.10	230	4.60	3,955
17.....	1.02	34	1.22	33	1.18	62	1.55	487	1.10	230	4.70	4,115
18.....	1.02	32	1.22	33	1.18	66	1.54	480	1.10	230	4.80	4,275
19.....	1.02	31	1.21	33	1.18	68	1.44	412	1.10	230	4.80	4,275
20.....	1.02	30	1.21	34	1.18	71	1.43	405	1.20	275	4.50	3,795
21.....	1.05	29	1.20	35	1.18	73	1.50	452	1.30	328	4.30	3,485
22.....	1.05	27	1.20	36	1.18	75	1.50	452	1.40	385	4.10	3,185
23.....	1.05	27	1.20	36	1.18	78	1.50	452	1.40	385	4.20	3,335
24.....	1.10	26	1.20	37	1.18	82	1.50	452	1.40	385	4.30	3,455
25.....	1.10	25	1.20	36	1.18	87	1.40	385	1.50	452	4.60	3,955
26.....	1.17	24	1.19	36	0.99	91	1.30	328	1.60	522	4.80	4,275
27.....	1.27	23	1.19 <sup>a</sup>	37	0.99	95	1.30	328	1.80	671	8.90	8,606
28.....	1.27	22	1.19	38	0.99	99	1.30	328	1.80	671	9.20	8,960
29.....	1.27	21	.....	.....	0.99	104	1.30	328	1.80	671	10.50	10,494
30.....	1.27	19	.....	.....	0.99	112	1.30	328	2.00	832	6.80	6,125
31.....	1.27	17	.....	.....	0.99	117	.....	.....	2.50	1,265	.....	.....

<sup>a</sup> Gauge height interpolated.<sup>b</sup> to <sup>b</sup> Ice conditions Jan. 1 to April 1.<sup>c</sup> to <sup>c</sup> Ice breaking up; discharge interpolated April 2 to 9.

DAILY GAUGE HEIGHT AND DISCHARGE of Pembina River near Entwistle, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.00	5,184	3.00	1,720	1.30	417	1.30	417	1.20	377	1.36	85
2.....	5.00	4,004	2.90	1,615	1.30	417	1.30	417	1.20	377	1.36	83
3.....	4.60	3,532	2.80	1,515	1.30	417	1.40	465	1.10	340	1.30	81
4.....	4.30	3,178	2.70	1,420	1.20	377	1.50	518	1.10	340	1.40	81
5.....	3.70	2,485	2.60	1,325	1.20	377	1.50	518	1.30	417	1.40	81
6.....	3.50	2,255	2.50	1,235	1.20	377	1.50	518	1.30	417	1.40	81
7.....	3.40	2,145	2.40	1,145	1.20	377	1.50	518	1.30	417	1.40	81
8.....	3.30	2,035	2.30	1,065	1.20	377	1.50	518	1.30	417	1.40	81
9.....	3.20	1,930	2.10	910	1.20	377	1.50	518	1.30	417	1.40	81
10.....	3.40	2,145	2.00	835	1.20	377	1.50	518	1.40	367b	1.40	81
11.....	4.00	2,830	1.90	767	1.20	377	1.50a	518	1.60	317	1.50	81
12.....	4.60	3,532	1.80	703	1.20	377	1.45a	492	1.60	267	1.50	82
13.....	5.00	4,004	1.70	639	1.20	377	1.40a	465	1.61	217	1.50	82
14.....	6.00	5,184	1.70	639	1.30	417	1.40	465	1.60	167b	1.50	82
15.....	7.60	7,072	1.70	639	1.30	417	1.40	465	1.60	177c	1.50	82
16.....	8.00	7,544	1.70	639	1.30	417	1.40	465	1.70	117	1.40	83
17.....	8.60	8,252	1.70	639	1.40	465	1.40	465	1.70	116	1.40	84
18.....	8.50	8,134	1.70	639	1.40	465	1.40	465	1.70	116	1.40	84
19.....	8.40	8,016	1.80	703	1.50	518	1.40	465	1.70	115	1.40	84
20.....	7.90	7,426	2.00	835	1.50	518	1.40	465	1.70	113	1.40	82
21.....	7.00	6,364	2.30	1,065	1.50	518	1.40	465	1.72	111	1.60	78
22.....	5.80	4,948	2.60	1,325	1.50	518	1.40	465	1.72	106	1.60	74
23.....	5.08	4,098	2.40	1,145	1.50	518	1.40	465	1.82	102	1.60	73
24.....	4.78	3,744	2.00	835	1.40	465	1.40	465	1.82	101	1.60	73
25.....	4.58	3,508	1.90	767	1.40	465	1.40	465	1.82	99	1.60	71
26.....	4.48	3,390	1.70	639	1.40	465	1.40	465	1.64	97	1.80	71
27.....	4.28	3,154	1.60	578	1.30	417	1.40	465	1.44	96	1.80	69
28.....	3.88	2,692	1.50	518	1.30	417	1.40	465	1.44	95	1.80	68
29.....	3.48	2,233	1.40	465	1.30	417	1.40	465	1.54	93	1.80	66
30.....	3.28	2,014	1.40	465	1.30	417	1.40	465	1.46	86	1.70	63
31.....	3.10	1,825	1.40	465	.....	.....	1.20	377	.....	.....	1.70	61c

a Gauge heights interpolated.

b to b Ice forming; discharge interpolated Nov. 10 to 14.

c to c Ice conditions Nov. 10 to Dec. 31.

## MONTHLY DISCHARGE of Pembina River near Entwistle, for 1915.

(Drainage area 1,858 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	59	17	40	0.022	0.02	2,460
February.....	38	9	29	0.016	0.02	1,611
March.....	117	39	66	0.036	0.04	4,058
April.....	983	126	510	0.274	0.31	30,347
May.....	1,265	230	418	0.225	0.26	25,702
June.....	10,494	1,780	4,266	2.300	2.57	253,845
July.....	8,252	1,825	4,157	2.237	2.58	255,604
August.....	1,720	465	900	0.484	0.56	55,339
September.....	518	377	428	0.230	0.26	25,468
October.....	518	377	474	0.255	0.29	29,145
November.....	417	86	218	0.117	0.13	12,972
December.....	85	61	78	0.042	0.05	4,796
The year.....	.....	.....	.....	.....	7.09	701,358

## SESSIONAL PAPER No. 25c

## SWAN RIVER NEAR KINUSO.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 23, Tp. 73, Rge. 10, W. 5th Mer. on the Edmonton, Dunvegan and British Columbia Railway bridge, one-half mile east of Kinuso.

*Records available.*—May 19 to October 31, 1915.

*Gauge.*—Vertical staff; elevation of zero 85.58 feet.

*Bench-marks.* (1) Marked on pier. Assumed elevation 100.00 feet. (2) Spike driven in eight-inch cottonwood tree, 50 feet from left bank of river and 130 upstream from the bridge, assumed elevation 107.08 feet.

*Channels.*—Two channels at all times.

*Discharge measurements.*—Made from bridge.

*Winter flow.*—No winter measurements taken.

*Observer.*—D. P. Pierce.

## DISCHARGE MEASUREMENTS of Swan River near Kinuso, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 19.....	P. H. Daniells.....	129	560	0.82	3.52	464
June 12.....	do.....	133	719	1.09	4.51	782
July 2.....	do.....	124	493	0.65	3.15	318
July 29.....	do.....	124	416	1.07	3.71	443
Aug. 19.....	do.....	99	253	0.48	2.20	120
Oct. 25.....	do.....	98	116	0.80	2.13	93

## DAILY GAUGE HEIGHT AND DISCHARGE of Swan River near Kinuso, for 1915.

DAY.	May.		June.		July.		August.		September.		October	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.75	498	3.25	345	3.22	336	1.82	53	2.12	98
2.....			3.95	568	3.10	300	3.17	321	1.82	53	2.12	98
3.....			7.60	2,015	3.10	300	3.27	351	1.82	53	2.22	114
4.....			8.55	2,395	2.95	262	3.22	336	1.82	53	2.32	134
5.....			8.25	2,275	2.85	240	3.12	306	1.77	46	2.32	134
6.....			7.85	2,115	2.75	220	3.02	280	1.77	46	2.22	114
7.....			7.75	2,075	2.65	200	2.92	255	1.82	53	2.22	114
8.....			7.15	1,835	2.55	180	2.77	224	1.82	53	2.12	98
9.....			6.05	1,395	2.75	220	2.92	255	1.82	53	2.12	98
10.....			6.05	1,395	2.95	262	2.82	234	1.82	53	2.22	114
11.....			5.75	1,275	4.71	859	2.77	224	1.92	68	2.22	114
12.....			4.70	855	4.96	950	2.92	255	2.82	234	2.22	114
13.....			4.55	795	4.86	919	2.77	224	2.67	204	2.32	134
14.....			4.40	735	5.56	1,199	2.92	255	2.72	211	2.22	114
15.....			4.25	675	6.21	1,459	2.77	224	2.87	244	2.12	98
16.....			3.95	568	6.41	1,539	2.62	194	2.87	244	2.02	83
17.....			3.55	435	6.26	1,479	2.47	164	2.77	224	2.12	98
18.....			3.35	375	6.66	1,639	2.42	154	2.72	214	2.12	98
19.....	3.60	420	3.20	330	6.56	1,599	2.22	114	2.62	194	2.17	106
20.....	3.40	390	3.35	375	6.36	1,519	2.22	114	2.72	214	2.22	114
21.....	3.30	360	3.70	480	6.21	1,459	2.22	114	2.62	194	2.12	98
22.....	3.25	345	3.85	532	5.71	1,259	2.32	134	2.52	174	2.12	98
23.....	3.35	375	3.65	465	5.16	1,039	2.22	114	2.52	174	2.12	98
24.....	4.15	638	3.65	465	4.81	899	2.22	114	2.47	164	2.12	98
25.....	4.05	603	3.55	435	4.56	799	2.12	98	2.42	154	2.18	107
26.....	3.80	515	3.50	420	4.36	719	2.12	98	2.32	134	2.18	107
27.....	3.85	532	3.40	390	4.06	606	2.22	114	2.37	124	2.28	126
28.....	3.95	568	3.65	465	3.40	408	2.02	83	2.32	114	2.18	107
29.....	3.75	498	3.45	405	3.71	484	2.02	83	2.22	114	2.13	100
30.....	3.75	498	3.25	345	3.61	453	1.92	68	2.22	114	2.13	100
31.....	3.65	465			3.56	438	1.87	60			2.13	100



## MONTHLY DISCHARGE of Swan River near Kinuso, for 1915.

(Drainage area 860 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (19-31).....	638	345	477	0.555	0.27	12,297
June.....	2,395	330	913	1.062	1.18	54,327
July.....	1,639	180	783	0.910	1.05	48,145
August.....	351	60	190	0.221	0.25	11,683
September.....	244	46	134	0.156	0.17	7,974
October.....	134	83	107	0.124	0.14	6,579
The period.....					3.06	141,005

## LESSER SLAVE LAKE AT GROUARD.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 19, Tp. 75, Rge. 14, W. 5th Mer., near Grouard post office in the province of Alberta.

*Established.*—September 23, 1914, by F. R. Burfield.

*Records available.*—Gauge heights taken at regular intervals of several days from September 23, 1914, to December 31, 1915.

*Gauge.*—Vertical staff. From date of establishment until January 22, 1916, located on a telegraph pole nearest to floating portion of bridge over Buffalo Bay on town side and maintained at zero elevation of 88.43 feet. On January 22, 1916, the gauge was moved into an artificial channel along the east shore inlet to Buffalo Bay and approximately 200 feet south-east of the bridge; new zero elevation 84.23 ft. All records have been reduced to this latter datum.

*Bench-mark.*—Spike at base of telegraph pole about 50 feet southeast of easterly end of bridge. Assumed elevation 96.33.

*Observer.*—Chas. Nash.

## DAILY GAUGE HEIGHT, IN FEET, of Lesser Slave Lake at Grouard, for 1914.

DAY.	Sept.	Oct.	Nov.	Dec.
1.....				
2.....				7.15
3.....		7.80		
4.....		7.95	7.55	
5.....				7.15
6.....				
7.....		7.85	7.50	
8.....				
9.....			7.05	7.15
10.....		7.89		
11.....			7.50	
12.....				7.10
13.....				
14.....		7.80	7.30	
15.....				
16.....				7.10
17.....		8.00		
18.....			7.45	
19.....				7.10
20.....				
21.....		7.85	7.45	
22.....				
23.....	7.85			7.10
24.....		7.70		
25.....			7.20	
26.....	7.85			7.10
27.....				
28.....		7.60	7.25	
29.....				
30.....	7.80			7.00
31.....		7.55		

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DAILY GAUGE HEIGHT, IN FEET, of Lesser Slave Lake at Grouard, for 1915.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					6.55				6.35			5.35
2	7.15					6.70				5.95		
3		6.95	6.75	6.55			7.15				5.35	5.23
4								7.15				5.35
5					6.80	6.85			6.30			
6	7.15	6.95	6.70							5.75		
7				6.75			7.15	7.10				
8					6.80				6.20			5.35
9	7.15					7.05				5.75	5.35	
10		6.90	6.65	6.75			7.15					
11								7.85	6.05			5.15
12					6.80	7.00						
13	7.15	6.85	6.75							5.70	5.40	
14				6.75			7.20	7.85				
15					7.15				6.15			5.15
16	7.05					7.20				5.60		
17		6.85	6.65	6.75			7.10				5.50	
18								7.75	6.05			5.15
19					6.75	7.15						
20	7.15	6.80	6.60							5.65	5.45	
21				6.75			7.10	7.65				
22					6.75	7.15			6.05			5.20
23	7.15									5.75		
24		6.75	6.55	6.85			7.10				5.35	
25								7.70	6.10			5.20
26					6.75	7.15						
27	7.05	6.75	6.55							5.55	5.35	
28				6.50			7.15	7.55				
29					6.75				6.15			5.20
30	7.05					7.15				5.55		
31			6.55				7.15					

## LESSER SLAVE LAKE NEAR SAWRIDGE.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 15, Tp. 73, Rge. 6, W. 5th Mer., on a bay in Dog Island three miles northwest of Sawridge.

*Records available.*—Gauge heights May 21, 1915, to December 31, 1915.

*Gauge.*—Vertical staff; 40 feet west of Herman Nicolas landing pier on Dog Island. Zero elevation maintained at 94.10 feet from May 21, 1915, to November 22, 1915. On November 22, 1915, zero elevation was changed to 91.70 feet. All records have been reduced to this latter datum.

*Bench-mark.*—Six-inch spike in poplar tree 20 feet from edge of lake and 60 feet east of gauge. Assumed elevation 100.00 feet.

*Observer.*—Herman Nicolas.

*Remarks.*—This station was established on May 21, 1915, by P. H. Daniells.

## DAILY GAUGE HEIGHT, IN FEET, of Lesser Slave Lake near Sawridge, for 1915.

DAY.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....		4.30	4.60	4.40	4.05	3.65	3.10	3.20
2.....		4.35	4.50	4.45	4.00	3.55	3.00	3.10
3.....		4.40	4.45	4.45	3.95	3.45	2.40	3.10
4.....		4.40	4.40	4.65	4.05	3.60	2.40	2.90
5.....		4.45	4.40	4.50	3.95	3.80	3.20	2.70
6.....		4.40	4.55	4.35	3.90	3.50	3.00	2.70
7.....		4.35	4.45	4.45	4.00	3.15	..... <sup>a</sup>	2.60
8.....		4.55	4.90	4.45	3.90	3.30	.....	2.60
9.....		4.45	4.40	4.35	3.80	3.55	.....	2.80
10.....		4.55	4.55	4.40	3.95	3.35	.....	2.80
11.....		4.45	4.60	4.40	3.75	3.40	.....	2.80
12.....		4.55	4.50	4.50	3.75	3.40	.....	2.80
13.....		4.70	4.50	4.45	3.65	3.15	.....	2.70
14.....		4.70	4.50	4.35	3.50	3.20	.....	2.90
15.....		4.60	4.45	4.40	3.55	3.25	.....	2.90
16.....		4.50	4.50	4.25	3.65	3.15	.....	2.90
17.....		4.50	4.60	4.30	3.65	3.20	.....	2.60
18.....		4.55	4.50	4.35	3.65	3.20	.....	2.50
19.....		4.50	4.50	4.35	3.70	3.15	.....	2.50
20.....		4.70	4.55	4.30	3.70	3.10	.....	2.60
21.....	4.30	4.50	4.60	4.30	3.65	2.40	..... <sup>a</sup>	2.60
22.....	4.25	4.65	4.60	4.20	3.70	3.15	3.60	2.50
23.....	4.25	4.60	4.60	4.15	3.50	3.10	3.70	2.50
24.....	4.20	4.60	4.60	4.10	3.55	3.25	3.50	2.50
25.....	4.15	4.55	4.60	4.05	3.50	3.05	3.30	2.40
26.....	4.25	4.50	4.60	4.00	3.45	3.00	3.50	2.60
27.....	4.25	4.55	4.65	4.05	3.60	3.10	3.40	2.60
28.....	4.25	4.55	4.55	3.95	3.55	3.20	3.20	2.60
29.....	4.45	4.80	4.60	3.90	3.50	3.15	3.20	2.60
30.....	4.20	4.70	4.50	3.90	.....	3.15	3.20	2.70
31.....	4.20	.....	4.50	4.45	.....	2.40	.....	2.70

<sup>a</sup> No readings taken Nov 7 to 21.

## LESSER SLAVE RIVER AT SAWRIDGE.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 7, Tp. 73, Rge. 5, W. 5th Mer., at traffic bridge about 150 feet south of the Sawridge hotel.

*Records available.*—May 20, 1915, to December 21, 1915.

*Gauge.*—Vertical staff, spiked to upstream pile of fifth bent of bridge from left bank. Elevation of zero maintained at 90.16 feet since establishment.

*Bench-mark.*—Spike driven in outside pile of north abutment. Assumed elevation 100.00 feet.

*Channel.*—One channel at all stages, shifting.

*Discharge measurements.*—Made from bridge.

*Winter flow.*—River affected by ice from November to April.

*Observer.*—C. J. Schurter.

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## DISCHARGE MEASUREMENTS of Lesser Slave River at Sawridge, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 20.....	P. H. Daniells.....	178	1,124	1.67	4.40	1,877
June 14.....	do.....	178	1,166	1.67	4.69	1,944
July 5.....	do.....	177	1,164	1.68	4.45	1,950
Aug. 2.....	do.....	177	1,198	1.78	4.50	2,123
Aug. 23.....	do.....	175	1,133	1.68	4.12	1,898
Oct. 28.....	do.....	157	1,013	1.51	3.27	1,527
Nov. 11.....	I. R. Strome.....	146	872	0.80	2.31	702
Nov. 13.....	do.....	144	825	0.72	2.57	597
Dec. 4.....	do.....	140	814	1.05	2.64	857
Dec. 29.....	C. M. O'Neil.....	140	883	0.64	2.83	567

## DAILY GAUGE HEIGHT AND DISCHARGE of Lesser Slave River at Sawridge, for 1915.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			4.40	2,060	4.60	2,185	4.50	2,120
2.....			4.55	2,152	4.60	2,185	4.50	2,120
3.....			4.70	2,250	4.60	2,185	4.60	2,185
4.....			4.60	2,185	4.50	2,120	4.50	2,120
5.....			4.60	2,185	4.40	2,060	4.40	2,060
6.....			4.60	2,185	4.40	2,060	4.60	2,185
7.....			4.60	2,185	4.50	2,120	4.70	2,250
8.....			4.60	2,185	4.50	2,120	4.60	2,185
9.....			4.60	2,185	4.60	2,185	4.50	2,120
10.....			4.60	2,185	4.40	2,060	4.50	2,120
11.....			4.60	2,185	4.70	2,250	4.70	2,250
12.....			4.60	2,185	4.60	2,185	4.50	2,120
13.....			4.90	2,380	4.50	2,120	4.50	2,120
14.....			4.70	2,250	4.50	2,120	4.50	2,120
15.....			4.50	2,120	4.40	2,060	4.40	2,060
16.....			4.60	2,185	4.40	2,060	4.40	2,060
17.....			4.60	2,185	4.40	2,060	4.40	2,060
18.....			4.60	2,185	4.60	2,185	4.40	2,060
19.....			4.60	2,185	4.70	2,250	4.40	2,060
20.....	4.40	2,060	4.60	2,185	4.70	2,250	4.30	2,000
21.....	4.40	2,060	4.70	2,250	4.70	2,250	4.60	2,185
22.....	4.40	2,060	4.80	2,315	4.80	2,315	4.30	2,000
23.....	4.40	2,060	4.60	2,185	4.70	2,250	4.30	2,000
24.....	4.20	1,942	4.60	2,185	4.70	2,250	4.30	2,000
25.....	4.40	2,060	4.60	2,185	4.70	2,250	4.20	1,942
26.....	4.40	2,060	4.50	2,120	4.70	2,250	4.20	1,942
27.....	4.40	2,060	4.70	2,250	4.70	2,250	4.20	1,942
28.....	4.30	2,000	4.70	2,250	4.70	2,250	4.00	1,834
29.....	4.50	2,120	4.60	2,185	4.70	2,250	4.00	1,834
30.....	4.40	2,060	4.60	2,185	4.70	2,250	3.90	1,782
31.....	4.40	2,060			4.70	2,250	4.60	2,185

DAILY GAUGE HEIGHT AND DISCHARGE of Lesser Slave River at Sawridge, for 1915—*Concluded.*

DAY.	September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.00	1,834	3.50	1,608	3.10	1,474	2.70	820
2.....	4.00	1,834	3.50	1,608	3.20	1,504	2.60	840
3.....	4.00	1,834	3.40	1,572	3.10	1,474	2.60	850
4.....	4.00	1,834	3.50	1,608	3.30	1,536	2.70	857
5.....	3.90	1,782	3.80	1,734	3.00	1,444	2.70	855
6.....	4.00	1,834	3.50	1,608	3.00	1,444	2.80	835
7.....	3.90	1,782	3.30	1,536	3.00	1,444	2.80	800
8.....	4.50	2,120	3.30	1,536	3.00	1,444	2.80	760
9.....	4.00	1,834	3.10	1,474	2.90	1,418	2.80	720
10.....	4.60	2,185	3.30	1,536	3.00	1,060a	2.80	680
11.....	4.90	2,380	3.60	1,648	2.40	702	2.80	655
12.....	3.80	1,734	3.20	1,504	2.70	650	2.80	620
13.....	3.80	1,734	3.10	1,474	2.50	600	2.80	580
14.....	4.10	1,886	3.10	1,474	2.70	610	2.80	590
15.....	3.50	1,608	3.10	1,474	2.70	620	2.70	600
16.....	3.60	1,648	3.10	1,474	2.90	630	2.70	605
17.....	4.20	1,942	3.30	1,536	2.60	640	2.70	615
18.....	3.70	1,688	3.50	1,608	2.80	660	2.70	620
19.....	3.80	1,734	3.20	1,504	2.90	670	2.70	630
20.....	3.70	1,688	3.20	1,504	2.90	680	2.70	635
21.....	3.60	1,648	2.90	1,418	2.90	700	2.80	640
22.....	3.60	1,648	3.10	1,474	3.00	710	2.80	630
23.....	3.70	1,688	3.10	1,474	2.80	720	2.70	620
24.....	3.60	1,648	3.10	1,474	2.80	740	2.70	610
25.....	3.60	1,648	2.90	1,418	2.80	750	2.70	605
26.....	3.40	1,572	2.90	1,418	2.80	760	2.70	595
27.....	3.40	1,572	3.00	1,444	2.70	770	2.70	585
28.....	3.40	1,572	3.10	1,474	2.70	790	3.00	580
29.....	3.10	1,474	3.30	1,536	2.70	800	2.80	570
30.....	3.80	1,734	3.20	1,504	2.70	810	2.70	570
31.....			3.20	1,504			2.70	565a

a to a Ice conditions.

## MONTHLY DISCHARGE of Lesser Slave River at Sawridge, for 1915.

(Drainage area 6,520 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (20-31).....	2,060	1,942	2,050	0.314	0.14	48,782
June.....	2,380	2,060	2,197	0.337	0.38	130,729
July.....	2,315	2,060	2,182	0.335	0.39	134,164
August.....	2,250	1,782	2,065	0.317	0.37	126,970
September.....	2,380	1,474	1,771	0.272	0.30	105,380
October.....	1,734	1,418	1,521	0.233	0.27	93,522
November.....	1,536	600	942	0.144	0.16	56,053
December.....	857	565	669	0.103	0.12	41,135
The period.....					2.13	736,735

## SESSIONAL PAPER No. 25c

## ATHABASKA RIVER AT ATHABASKA.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 20, Tp. 66, Rge. 22, W. 4th Mer., 400 feet above the ferry cable in the town of Athabaska.

*Records available.*—March 17, 1914, to December 31, 1915. Discharge measurements only during the winter of 1912-13 and 1913-14.

*Drainage area.*—29,200 square miles; taken from small scale map and is liable to be in error.

*Gauge.*—Inclined staff, located on left bank of river, 300 feet above ferry cable and 100 feet below measuring section. Zero elevation of gauge maintained at 1,635.38 feet since establishment.

*Bench-marks.*—On a track spike in a telegraph pole on right bank of river; pole located at foot of Strathcona street, north side of C.N.R. track, and opposite Hudson Bay Co's. office. Elevation, 1,660.60 feet. (Canadian Northern Railway datum.) Permanent iron bench-mark set on June 4, 1915, on the left bank close to the downstream side of the cable winch. Elevation, 1,658.00 feet. (Canadian Northern Railway datum.)

*Channel.*—One slightly shifting channel at all stages.

*Discharge measurements.*—Made from a boat run on a cable.

*Winter flow.*—Stream affected by ice from November to April.

*Observer.*—L. J. Cole.

## DISCHARGE MEASUREMENTS of Athabaska River at Athabaska, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 6	P. H. Daniells	685	3,314	1.16	3.61	3,855
Jan. 27	R. J. McGuinness	670	2,891	1.27	3.26	3,630
Feb. 24	do	670	2,329	1.24	2.94	2,878
Mar. 24	J. M. Paul	678	2,977	1.49	3.67	4,439
April 22	L. R. Strome	688	4,364	2.13	3.34	9,151
May 12	do	711	5,223	2.73	4.56	14,051
June 1	do	740	6,170	3.11	5.76	19,018
June 17	do	812	9,247	4.52	9.39	41,198
July 22	do	833	12,776	5.85	13.31	73,561
Aug. 24	do	801	8,251	3.84	7.91	31,174
Sept. 14	do	698	5,022	2.67	4.46	13,089
Sept. 27	do	695	4,716	2.42	3.90	11,436
Oct. 14	do	685	4,225	2.06	3.29	8,719
Nov. 2	do	678	3,944	2.03	3.02	8,016
Nov. 27	do	835	3,477	1.24	3.50	4,305
Nov. 29	do	835	3,286	1.25	3.40	4,110
Dec. 21	I. R. Strome and C. M. O'Neil	830	2,706	1.21	3.58	3,277

## DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska River at Athabaska, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.58	3,330 <sup>a</sup>	3.15	3,640	2.86	3,080	4.50	8,500	2.95	7,887	5.62	18,395
2.....	3.58	3,500	3.10	3,620	2.86	3,090	4.60	10,600	3.00	8,050	5.82	19,345
3.....	3.59	3,590	3.10	3,620	2.86	3,130	4.60	12,300	2.95	7,887	6.20	21,200
4.....	3.60	3,690	3.05	3,600	2.86	3,150	4.98	14,000	2.98	7,985	6.68	23,840
5.....	3.61	3,770	3.00	3,600	2.86	3,200	5.00	15,600 <sup>a</sup>	3.05	8,212	7.90	31,050
6.....	3.61	3,850	3.00	3,570	2.87	3,220	4.87	15,048	3.22	8,770	8.45	34,650
7.....	3.60	3,890	2.95	3,510	2.87	3,250	4.72	14,410	3.22	8,770	8.40	34,300
8.....	3.60	3,870	2.90	3,440	2.87	3,300	4.81 <sup>b</sup>	14,792	3.32	9,120	8.18	32,870
9.....	3.60	3,860	2.90	3,440	2.92	3,360	4.90 <sup>b</sup>	15,175	3.42	9,470	8.12	32,480
10.....	3.60	3,830	2.95	3,450	2.92	3,430	5.00	15,600	3.65	10,275	8.02	31,830
11.....	3.60	3,790	3.00	3,450	2.93	3,490	4.90	15,175	4.12	11,980	8.88	37,660
12.....	3.60	3,780	3.00	3,420	2.93	3,540	4.77	14,623	4.62	13,985	10.25	47,900
13.....	3.50	3,760	3.00	3,390	2.98	3,600	4.72	14,410	5.02	15,690	10.38	48,940
14.....	3.50	3,690	3.00	3,300	2.98	3,670	4.62	13,985	5.42	17,490	10.25	47,900
15.....	3.50	3,600	3.00	3,220	2.98	3,730	4.33	12,820	5.45	17,625	9.95	45,563
16.....	3.50 <sup>b</sup>	3,510	3.00	3,130	3.04	3,800	4.20	12,360	5.20	16,500	9.62	43,050
17.....	3.50	3,600	3.05	3,050	3.09	3,890	4.01	11,540	4.90	15,175	9.37	41,183
18.....	3.40	3,750	3.05	2,950	3.14	3,960	3.84	10,940	4.82	14,835	9.18	39,805
19.....	3.40	3,750	3.00	2,900	3.19	4,030	3.67	10,345	4.68	14,240	9.45	42,005
20.....	3.40	3,700	3.00	2,880	3.19	4,140	3.48	9,680	4.38	13,020	9.98	45,795
21.....	3.30	3,640	3.00	2,870	3.25	4,210	3.42	9,470	4.25	12,500	9.95	45,563
22.....	3.30	3,600	3.00	2,860	3.35	4,300	3.32	9,120	4.05	11,700	9.45	42,005
23.....	3.20	3,550	2.95	2,870	3.55	4,390	3.35	9,225	4.08	11,820	9.10	39,225
24.....	3.20	3,540	2.90	2,880	3.65	4,440	3.30	9,050	4.20	12,300	9.30	40,675
25.....	3.20	3,520	2.90	2,910	3.75	4,640	3.22	8,770	4.70	14,325	8.52	35,140
26.....	3.30	3,570	2.95	2,930	3.80	4,800	3.18	8,635	4.75	14,537	8.32	33,780
27.....	3.30	3,630	2.95	3,000	3.90	5,000	3.15	8,537	4.82	14,835	8.25	33,325
28.....	3.30	3,650	2.90	3,000	4.05	5,190	3.05	8,212	5.40	17,400	9.32	40,820
29.....	3.20	3,640	.....	.....	4.20	5,520	2.95	7,887	5.95	20,163	14.90	87,400
30.....	3.20	3,650	.....	.....	4.30	6,000	2.90	7,725	6.05	20,450	16.08	97,620
31.....	3.20	3,650	.....	.....	4.40	6,800	.....	.....	5.85	19,488	.....	.....

<sup>a</sup> to <sup>a</sup> Ice conditions.<sup>b</sup> Gauge height interpolated.<sup>c</sup> Maximum gauge height 16.50 ft.; discharge 101,800 sec.-ft.



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska River at Athabaska, for 1915—*Concluded*.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	14.22	81,325	8.79	37,030	6.40	22,300	3.64	10,240	2.99	8,018	3.30	4,000
2.	12.95	70,275	8.53	35,210	6.33	21,915	3.60	10,100	3.04	8,180	3.35	4,010
3.	11.80	60,550	8.33	33,845	6.35	22,025	3.52	9,820	3.01	8,082	3.40	4,000
4.	11.00	53,950	8.23	33,195	6.30	21,750	3.50	9,750	2.91	7,757	3.25	3,900
5.	10.20	47,500	8.20	33,000	5.95	20,163	3.47	9,665	2.79	7,370	3.00	3,740
6.	9.48	42,000	8.17	32,805	5.59	18,255	3.51	9,785	2.69	7,070	3.20	3,620
7.	9.02	38,645	8.30	33,650	5.52	17,940	3.66	10,310	2.51	6,530	3.10	3,560
8.	8.88	37,660	8.10	32,350	5.54	18,030	3.69	10,415	2.54	6,620	3.10	3,500
9.	8.80	37,100	7.77	30,220	5.46	17,670	3.59	10,065	2.79	7,370	3.20	3,500
10.	8.95	38,150	7.55	28,900	5.36	17,220	3.50	9,750	2.79	7,370	3.30	3,470
11.	8.90	37,800	7.65	29,500	5.18	16,410	3.50	9,750	2.07	5,292	3.40	3,380
12.	9.30	40,675	7.61	29,260	4.81	14,792	3.50	9,750	1.59	4,700 <sub>a</sub>	3.55	3,200
13.	12.30	64,750	7.48	28,480	4.65	14,112	3.38	9,330	2.14	4,630	3.66	3,170
14.	12.52	66,620	7.28	28,280	4.53	13,620	3.31	9,085	3.07	4,640	3.71	3,170
15.	11.82	60,715	7.16	26,560	4.33	12,820	3.24	8,840	3.01	4,640	3.71	3,180
16.	12.25	64,325	7.02	25,720	4.23	12,420	3.17	8,603	3.28	4,610	3.71	3,190
17.	14.38	82,725	6.89	24,995	4.28	12,620	3.14	8,505	3.68	4,580	3.76	3,190
18.	15.10	89,200	6.76	24,180	4.31	12,740	3.11	8,407	3.28	4,570	3.76	3,180
19.	15.30	91,000	6.82	24,610	4.25	12,500	3.09	8,343	3.22	4,570	3.81	3,200
20.	15.42	92,080	7.00	25,600	4.23	12,420	3.04	8,180	3.22	4,540	3.71	3,230
21.	14.38	82,725	7.30	27,400	4.23	12,420	2.97	7,953	3.37	4,400	3.66	3,280
22.	13.42	74,325	7.87	30,855	4.23	12,420	2.91	7,757	3.21	4,300	3.66	3,280
23.	12.60	67,300	8.40	34,300	4.23	12,420	2.94	7,855	3.31	4,320	3.71	3,260
24.	11.95	61,787	8.00	31,700	4.33	12,820	3.09	8,343	3.51	4,330	3.81	3,200
25.	11.55	58,487	7.66	29,560	4.24	12,460	3.04	8,180	3.66	4,340	3.76	3,150
26.	11.22	55,765	7.48	28,480	4.12	11,980	3.04	8,180	3.66	4,350	3.76	3,100
27.	10.62	50,860	7.36	27,660	3.97	11,395	2.97	7,953	3.55	4,310	3.76	3,050
28.	10.00	45,950	7.24	27,040	3.87	11,045	2.99	8,018	3.40	4,200	3.71	3,010
29.	9.55	42,525	7.14	26,440	3.84	10,940	2.97	7,953	3.40	4,110	3.76	2,990
30.	9.15	39,587	7.01	25,660	3.74	10,590	2.99	8,018	3.40	4,000	3.76	2,940
31.	8.98	38,360	6.68	23,840	.....	.....	2.97	7,953	.....	.....	3.61	2,890 <sub>a</sub>

*a* to *a* Ice conditions.

## MONTHLY DISCHARGE of Athabaska River at Athabaska, for 1915.

(Drainage area 29,200 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	3,890	3,330	3,669	0.126	0.145	225,598
February	3,640	2,860	3,232	0.111	0.118	179,500
March	6,890	3,080	4,044	0.138	0.159	248,654
April	15,600	7,725	11,616	0.398	0.444	681,200
May	20,450	7,887	13,112	0.449	0.518	806,226
June	97,620	18,395	40,510	1.387	1.548	2,410,500
July	92,080	37,100	58,539	2.004	2.310	3,599,418
August	37,030	23,840	29,365	1.006	1.160	1,805,610
September	22,300	10,590	15,007	0.514	0.574	893,989
October	10,415	7,757	8,929	0.306	0.353	549,019
November	8,180	4,000	5,460	0.187	0.209	324,890
December	4,010	2,890	3,340	0.114	0.131	205,370
The year	.....	.....	.....	.....	7.667	11,930,994

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Athabaska drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Jan. 15....	R. J. McGuinness..	Embarras River...	SW. 5-52-18-5....	104	72.9	0.32	24,000
April 6....	J. M. Paul.....	do .....	do .....	135	154.0	1.44	221,000
Nov. 4....	do .....	do .....	do .....	98	188.0	1.04	196,000
Nov. 17....	do .....	do .....	do .....	115	174.0	0.69	120,000
Dec. 6....	do .....	do .....	do .....	110	135.0	0.39	53,000
April 8....	do .....	Fiddle Creek.....	SE. 15-49-27-5....	11	4.9	0.92	4,500
Aug. 6....	do .....	do .....	do .....	86	64.8	2.20	142,000
Sept. 7....	do .....	do .....	do .....	52	36.5	2.16	79,000
June 10....	do .....	Happy Creek.....	SE. 14-51-25-5....	8	5.6	1.41	7,800
Sept. 10....	do .....	do .....	do .....	11	10.6	0.92	9,800
Oct. 15....	do .....	Hardisty Creek....	SE. 24-51-25-5....	17	8.9	0.76	6,800
May 18....	do .....	Maligne River....	SW. 33-45-28-5....	20	17.5	0.71	12,500
June 4....	do .....	do .....	do .....	35	34.9	2.09	73,000
June 25....	do .....	do .....	do .....	49	51.3	2.46	126,000
July 13....	do .....	do .....	do .....	51	61.0	3.77	230,000
Aug. 2....	do .....	do .....	do .....	46	41.2	2.64	108,000
Aug. 18....	do .....	do .....	do .....	46	39.4	2.45	97,000
Sept. 2....	do .....	do .....	do .....	45	28.2	2.10	59,000
Sept. 23....	do .....	do .....	do .....	19	15.2	1.67	26,000
Oct. 7....	do .....	do .....	do .....	23	18.8	0.87	16,400
May 5....	do .....	Prairie Creek.....	SE. 8-51-25-5....	27	30.5	0.95	29,000
May 24....	do .....	do .....	do .....	33	24.2	1.15	28,000
June 11....	do .....	do .....	do .....	52	77.6	3.01	234,000
July 3....	do .....	do .....	do .....	40	68.0	3.78	237,000
Aug. 7....	do .....	do .....	do .....	43	40.4	1.51	61,000
Aug. 23....	do .....	do .....	do .....	42	40.1	2.10	80,000
Sept. 8....	do .....	do .....	do .....	41	27.2	1.40	38,000
Sept. 27....	do .....	do .....	do .....	39	23.0	1.47	34,000
Oct. 13....	do .....	do .....	do .....	36	26.3	0.82	22,000
Nov. 1....	do .....	do .....	do .....	32	27.7	0.96	27,000
Jan. 19....	R. J. McGuinness..	Snaring River.....	NW. 33-46-1-6....	50	60.0	0.63	38,000
Mar. 18....	J. M. Paul.....	do .....	do .....	35	30.5	1.14	35,000
April 26....	do .....	do .....	do .....	110	129.0	2.12	273,000
May 17....	do .....	do .....	do .....	139	200.0	3.10	620,000
June 5....	do .....	do .....	do .....	197	425.0	4.45	1891,000
July 15....	do .....	do .....	do .....	258	467.0	3.94	1840,000
Aug. 20....	do .....	do .....	do .....	219	315.0	3.59	1132,000
Sept. 3....	do .....	do .....	do .....	132	136.0	3.46	471,000
Sept. 22....	do .....	do .....	do .....	121	139.0	1.73	241,000
Oct. 8....	do .....	do .....	do .....	76	79.6	1.71	137,000
Oct. 28....	do .....	do .....	do .....	106	102.0	2.77	283,000
Dec. 14....	do .....	do .....	do .....	45	46.0	1.74	80,000
Mar. 11....	do .....	Spring River.....	SE. 2-51-26-5....	.....	.....	.....	0.003
May 6....	do .....	do .....	do .....	.....	.....	.....	0.003
May 25....	do .....	do .....	do .....	.....	.....	.....	0.004
June 10....	do .....	do .....	do .....	.....	.....	.....	0.004
July 20....	do .....	do .....	do .....	.....	.....	.....	0.004
Aug. 8....	do .....	do .....	do .....	.....	.....	.....	0.003
Aug. 24....	do .....	do .....	do .....	.....	.....	.....	0.010
Sept. 9....	do .....	do .....	do .....	.....	.....	.....	0.017
Sept. 28....	do .....	do .....	do .....	.....	.....	.....	0.020
Oct. 14....	do .....	do .....	do .....	.....	.....	.....	0.022
Nov. 2....	do .....	do .....	do .....	.....	.....	.....	0.022
Mar. 15....	do .....	Stony River.....	NW. 26-48-28-5....	51	96.0	1.11	107,000
May 23....	do .....	do .....	do .....	207	624.0	2.62	1635,000
Aug. 5....	do .....	do .....	do .....	165	625.0	3.64	2273,000
Sept. 25....	do .....	do .....	do .....	81	323.0	1.79	577,000
Dec. 10....	do .....	do .....	do .....	38	85.8	0.83	71,000
April 6....	do .....	Sundance Creek....	NW. 3-53-18-5....	50	48.5	1.82	88,000
April 22....	do .....	do .....	do .....	33	27.9	1.89	53,000
Nov. 4....	do .....	do .....	do .....	34	50.2	1.40	70,000
Aug. 25....	do .....	Wolf Creek.....	SW. 3-54-16-5....	64	78.2	1.73	135,000
Sept. 14....	do .....	do .....	do .....	52	57.4	1.12	64,000
Sept. 29....	do .....	do .....	do .....	48	54.1	1.06	57,000
Oct. 19....	do .....	do .....	do .....	45	41.2	2.61	107,000
Nov. 5....	do .....	do .....	do .....	43	37.0	1.89	70,000

## NORTH SASKATCHEWAN RIVER DRAINAGE BASIN.

*General Description.*

The North Saskatchewan River draws its principal water supply from the eastern slope of the Rocky Mountains. The basin is bounded on the south by those of the Red Deer and South Saskatchewan Rivers and on the north by those of the Athabaska and Churchill Rivers. The general trend of the stream from its source to where it joins the South Saskatchewan, a few miles below the city of Prince Albert, and forms the Saskatchewan River, is easterly.

The basin of the river easily divides itself into five parts or divisions, each of which requires a separate description for a clear understanding of the conditions of run-off.

The first, or upper section, consists of the eastern slope of the Rocky Mountains. While this part of the basin is not the greatest in area, it supplies the greater part of the run-off. In glaciers and the perpetual snows of the higher peaks innumerable small streams rise which form the main stream and its larger tributaries. These streams have well defined rocky valleys and considerable fall. The upper regions of this section are not well wooded, and allow a rapid run-off of melting snow and rain.

East of this first section is a division consisting of the foothills, which are, for the most part, well covered with forest and vegetable growth, forming probably the largest in area of the five sections. Here also is a very large source of supply for the stream, but due to its cover, a more regulated supply than in the first section. In this section the main stream is joined by the Clearwater and Brazeau Rivers, two of the most important tributaries of the whole basin. The streams in this section flow through deep valleys with fairly permanent beds and medium slopes.

From a little west of the city of Edmonton to the mouth of the Vermilion River the country is of a parklike nature with large stretches of prairie. This section is small in area and has not a very large run-off. The principal tributaries are the Sturgeon and Vermilion Rivers, the first of which drains in from the wooded country of the north, the latter from the prairie section of the south. The main stream is in a well defined valley with large flats along its course and a more or less permanent bed with a small slope.

Below the third section to a little above the city of Prince Albert is a division which has little drainage into the river. It consists of prairie uplands for the most part, with small patches of timber to the north. The stream widens out into shallow reaches, full of shifting sand bars, and has very little slope. The valley, while still well defined, is also much wider. In this section the main stream is fed by the Battle River, which has its source at the outlet of Battle Lake, and flows eastward through park land and prairie sections south of the main river, until it empties into the latter at the town of Battleford.

The east division is one in which the river with a greater slope and more permanent bed, narrows considerably, as does also the valley. The run-off in this division is mostly from the north, which consists of well wooded country drained by a number of small streams.

Reports of floods in this basin may be found on pages 30 and 31 of the Report of the Progress of Stream Measurements for 1912, and Appendix No. 4 of this report.

## MISTAYA RIVER

*Location.*—Tp. 34, Rge. 20, W. 5th Mer., about one-quarter mile above mouth of stream.

*Records available.*—Discharge measurements only.

*Gauge.*—None established.

*Bench-mark.*—Standard wooden. Located on left bank about 250 feet above cable. Assumed elevation of 100.00 feet.

*Channel.*—Fairly permanent, bed consisting of small stones and boulders.

*Discharge measurements.*—Made by wading, or from a cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood overflowing its banks at the lower flats and reaching an elevation of 96.53 feet relative to bench-mark. The slope method gives a corresponding maximum discharge of 2,166 sec.-ft.

*Observer.*—None obtainable.

DISCHARGE MEASUREMENTS of Mistaya River in Tp. 34, Rge. 20, W. 5th Mer., in 1915

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27.	O. H. Hoover	92.0	245.0	8.84	96.53 <sup>a</sup>	2166 <sup>a</sup>
July 2.	do	72.2	170.3	5.88	96.00 <sup>b</sup>	1003
Oct. 9.	do	41.0	58.6	2.13	94.73 <sup>b</sup>	125

<sup>a</sup> Slope measurement.

<sup>b</sup> Water surface elevation.

## SIFFLEUR RIVER NEAR WILSON'S RANCH.

*Location.*—Tp. 35, Rge. 17, W. 5th Mer., about three miles southwest of the Wilson Ranger cabin, one and one-half miles above the mouth of the stream.

*Records available.*—Gauge heights, May 17 to May 29, 1915. Discharge measurements during open water season 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 89.18 feet since establishment.

*Bench-mark.*—Standard wooden. Located on the right bank about two hundred feet above the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Permanent, consisting of gravel rock.

*Discharge measurements.*—Made from a cable or by wading.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in violent flood but did not overflow its banks. A stage elevation of 90.64 feet, relative to bench-mark, being about two feet above normal high water, was reached. The slope method gives a corresponding discharge of 1,662 sec.-ft.

*Observer.*—J. W. Chalmers.

## DISCHARGE MEASUREMENTS of Siffleur River near Wilson's ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27.....	O. H. Hoover.....	56.0	253.4	6.56	.....	1,662 <sup>a</sup>
June 28.....	do.....	52.0	208.4	3.33	3.10	694
July 4.....	do.....	51.7	177.6	7.62	3.90	1,354
Oct. 6.....	do.....	53.0	114.0	1.88	1.94	214
Oct. 30.....	do.....	53.2	98.3	1.37	1.69	135

<sup>a</sup> Slope measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Siffleur River near Wilson's ranch, for 1915.

DAY.	May.	
	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	.....
2.....	.....	.....
3.....	.....	.....
4.....	.....	.....
5.....	.....	.....
6.....	.....	.....
7.....	.....	.....
8.....	.....	.....
9.....	.....	.....
10.....	.....	.....
11.....	.....	.....
12.....	.....	.....
13.....	.....	.....
14.....	.....	.....
15.....	.....	.....
16.....	.....	.....
17.....	1.75	155
18.....	2.16 <sup>a</sup>	281
19.....	2.58 <sup>a</sup>	432
20.....	2.50	400
21.....	2.60 <sup>a</sup>	440
22.....	2.70 <sup>a</sup>	485
23.....	2.80	530
24.....	2.74 <sup>a</sup>	503
25.....	2.68 <sup>a</sup>	476
26.....	2.61 <sup>a</sup>	444
27.....	2.54 <sup>a</sup>	416
28.....	2.47 <sup>a</sup>	390
29.....	2.40	365
30.....	.....	.....
31.....	.....	.....

<sup>a</sup> Gauge heights interpolated.

## SESSIONAL PAPER No. 25c

## NORTH SASKATCHEWAN RIVER AT WILSON'S RANCH.

*Location.*—Tp. 36, Rge. 18, W. 5th Mer., about one-half mile southwest of the Wilson Ranger cabin.

*Records available.*—Discharge measurements throughout open water season. Gauge heights May 15 to May 31, 1915.

*Gauge.*—Vertical staff maintained at zero elevation of 85.13 feet since establishment.

*Bench-mark.*—Standard wooden. Located on the right bank two hundred and twenty feet below cable. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of sand and gravel and stone.

*Discharge measurements.*—Made from a cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June 1915, stream was in a violent state of flood but did not overflow its banks. A gauge height of 10.61 feet was reached. The slope method gives a corresponding discharge of 21,176 sec.-ft.

*Observer.*—J. W. Chalmers.

## DISCHARGE MEASUREMENTS of North Saskatchewan River at Wilson's ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 18.....	O. H. Hoover.....	183	495	2.71	4.64	1,343
June 20.....	do .....	197	885	4.23	6.55	3,746
June 27.....	do .....	214	1,964	10.78	10.61	21,176 <sub>a</sub>
July 6.....	do .....	209	1,457	7.00	8.78	10,198
Oct. 5.....	do .....	181	465	2.62	4.51	1,219
Oct. 29.....	do .....	177	378	2.33	4.02	881

*a* Slope measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Wilson's ranch, for 1915.

DAY.	May.	
	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		
2.....		
3.....		
4.....		
5.....		
6.....		
7.....		
8.....		
9.....		
10.....		
11.....		
12.....		
13.....		
14.....		
15.....	4 85	1,495
16.....	4 60	1,280
17.....	4 50	1,200
18.....	4 65	1,320
19.....	4 80	1,400
20.....	5 00	1,640
21.....	5 40	2,000
22.....	5 55	2,240
23.....	5 60	2,280
24.....	5 75	2,480
25.....	5 80	2,540
26.....	5 85	2,600
27.....	5 85	2,540
28.....	5 65	2,000
29.....	5 70	2,080
30.....	5 75	2,120
31.....	5 72	2,080

## MONTHLY DISCHARGE of North Saskatchewan River at Wilson's ranch, for 1915.

(Drainage area 836 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (15-31).....	2,605	1,200	2,035	2.43	1.54	68,602
The period.....						

## WHITERABBIT CREEK AT WILSON'S RANCH.

*Location.*—Tp. 36, Rge. 18, W. 5th Mer., about three hundred feet downstream from the Wilson Forest Ranger cabin. On July 7 this station was moved upstream about one mile on account of the change in the course of the Whiterabbit Creek caused by the June flood.

*Records available.*—May 16 to May 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 92.58 feet since establishment.

*Channel.*—Shifting, bed of stream sand and gravel.

*Discharge measurements.*—Made by wading or from a temporary cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood overflowing its banks, and causing a complete diversion of the stream at a point about two miles above its mouth. A maximum gauge height of about 6.00 feet was reached.

*Observer.*—J. W. Chalmers.

## DISCHARGE MEASUREMENTS of Whiterabbit Creek at Wilson's ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 13.....	O. H. Hoover.....	21.2	16.5	2.42	..... <sup>a</sup>	40
May 18.....	do.....	16.0	12.9	1.47	2.30	19
June 20.....	do.....	32.5	33.6	2.47	2.87	83
June 21.....	do.....	34.5	43.7	4.26	3.10	186
July 7.....	do.....	22.0	39.4	5.63	80.83 <sup>c</sup>	222 <sup>b</sup>
Oct. 6.....	do.....	20.0	12.0	2.08	80.52 <sup>c</sup>	25 <sup>b</sup>

<sup>a</sup> Gauge not installed.

<sup>b</sup> Discharge of new gauging station.

<sup>c</sup> Elevation of water level.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Whiterabbit Creek at Wilson's ranch, for 1915.

DAY.	May.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1.....		
2.....		
3.....		
4.....		
5.....		
6.....		
7.....		
8.....		
9.....		
10.....		
11.....		
12.....		
13.....		
14.....		
15.....		
16.....	2 25	17.0
17.....	2 30	19.0
18.....	2 30	19.0
19.....	2 35	21.0
20.....	2 40	23.0
21.....	2 55	33.0
22.....	2 60	37.0
23.....	2 65	42.0
24.....	2 70	48.0
25.....	2 70	48.0
26.....	2 60	37.0
27.....	2 55	33.0
28.....	2 65	42.0
29.....	2 60	37.0
30.....	2 60	37.0
31.....	2 65	42.0

## MONTHLY DISCHARGE of Whiterabbit Creek at Wilson's ranch, for 1915.

(Drainage area 213 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (16-31) .....	48	17	33	0 155	0 09	1,047
The period.....						

## CLINE RIVER

*Location.*—Tp. 37, Rge. 18, W. 5th Mer., about three miles above mouth of stream.*Records available.*—Discharge measurements only.*Gauge.*—None established.*Bench-mark.*—Standard wooden. Located 250 feet downstream from cable on the left bank. Assumed elevation of 100.00 feet.*Channel.*—Shifting, consisting of sand, gravel and rock.*Discharge measurements.*—Made by wading or from a cable.



*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood but did not overflow its banks at cable. An elevation of 98.00 feet relative to bench-mark was reached.

*Observer.*—None obtainable.

#### DISCHARGE MEASUREMENTS of Cline River in Tp. 37, Rge. 18, W. 5th Mer., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 18.....	O. H. Hoover.....	37	202.0	3.97	84.25b	802
July 9.....	do.....	39	203.2	8.43	88.05b	1,714
Sept. 15.....	do.....	62	96.8	3.46	84.77b	335
Oct. 4.....	do.....	66	103.0	2.73	84.34b	284
Nov. 1.....	do.....	61	88.2	2.41	83.93b	213
Nov. 18.....	do.....	64	80.0	2.01	83.73b	161a

a Slight ice conditions.

b Water surface elevation.

#### BIGHORN RIVER

*Location.*—Tp. 39, Rge. 16, W. 5th Mer., about two miles above mouth of stream.

*Records available.*—Discharge measurements only.

*Gauge.*—None established.

*Bench-mark.*—Standard wooden. Located on left bank about 30 feet from water edge and about 600 feet downstream from cable. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of sand, gravel and small boulders.

*Discharge measurements.*—Made by wading or from a cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood overflowing its banks and reaching an elevation of about 99.00 feet relative to bench-mark.

*Observer.*—None obtainable.

#### DISCHARGE MEASUREMENTS of Bighorn River in Tp. 39, Rge 16, W. 5th Mer., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 14.....	O. H. Hoover.....	53.0	64.9	4.07	95.04	264
July 11.....	do.....	81.0	94.0	4.27	95.63	401
Sept. 17.....	do.....	49.5	42.4	3.16	94.82	134
Oct. 3.....	do.....	58.0	43.7	2.68	94.88	117
Nov. 3.....	do.....	35.0	25.2	1.35	94.56a	34
Nov. 21.....	do.....	14.0	14.1	1.85	96.27b	27

a Slush ice running.

b Ice conditions.

#### MARTIN CREEK NEAR NORDEGG.

*Location.*—SE.  $\frac{1}{4}$  Sec. 27, Tp. 40, Rge. 15, W. 5th Mer., about one-quarter of a mile due south of the Canadian Northern Railway depot at Nordegg, and 300 feet upstream from the town power plant.

*Records available.*—June 12 to October 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 95.31 feet since establishment.

*Bench-mark.*—Standard wooden. Located on left bank about 40 feet downstream from the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Shifting, consisting of sand, gravel and clay.

*Discharge measurements.*—Made by wading or by a weir.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood, overflowing its banks and reaching a gauge height of about 5 feet.

*Observer.*—John Wise, June 12 to September 4; F. Birch, September 5 to October 31.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Martin Creek near Nordegg, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 12.....	O. H. Hoover.....	3.0	1.65	3.22	2.20	5.40
July 15.....	do.....	5.8	5.36	2.84	0.83	15.20
July 16.....	do.....	11.3	6.70	2.09	0.76	14.00
Aug. 17.....	do.....	4.7	1.68	0.39	0.33	0.66
Aug. 18.....	do.....	2.8	0.41	0.88	0.35	0.36
Aug. 18.....	do.....	a			0.35	0.49
Aug. 20.....	do.....	a			0.40	0.81
Sept. 29.....	do.....	a			0.25	0.21
Nov. 5.....	do.....	a				0.04
Nov. 9.....	do.....	b			1.28	0.01

a Weir measurement.  
b Ice conditions.

## DAILY GAUGE HEIGHT AND DISCHARGE of Martin Creek near Nordegg, for 1915.

Day.	June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.70	9.1	0.45	1.40	0.24	0.18	0.20	0.10
2.....			0.65	6.7	0.45	1.40	0.26	0.22	0.20	0.10
3.....			0.60	4.9	0.45	1.40	0.24	0.18	0.20	0.10
4.....			0.60	4.9	0.41	0.92	0.24	0.18	0.20	0.10
5.....			0.55	3.4	0.40	0.80	0.22	0.14	0.19	0.09
6.....			0.65	6.7	0.40	0.80	0.22	0.14	0.18	0.07
7.....			0.60	4.9	0.40	0.80	0.24	0.18	0.18	0.07
8.....			0.60	4.9	0.40	0.80	0.24	0.18	0.18	0.07
9.....			0.60	4.9	0.40	0.80	0.26	0.22	0.17	0.06
10.....			0.60	4.9	0.38	0.64	0.26	0.22	0.17	0.06
11.....			0.60	4.9	0.36	0.48	0.25	0.20	0.17	0.06
12.....	2.20	5.00	0.60	4.9	0.35	0.40	0.26	0.22	0.16	0.04
13.....	2.15	4.00	0.60	4.9	0.34	0.38	0.25	0.20	0.16	0.04
14.....	2.08	2.60	0.96	25.0	0.33	0.36	0.25	0.20	0.16	0.04
15.....	2.02	1.40	0.85	17.8	0.33	0.36	0.24	0.18	0.16	0.04
16.....	2.00	1.00	0.85	17.8	0.33	0.36	0.24	0.18	0.16	0.04
17.....	2.05	2.00	0.75	11.8	0.32	0.34	0.24	0.18	0.15	0.03
18.....	2.05	2.00	0.70	9.1	0.37	0.56	0.24	0.18	0.15	0.03
19.....	2.10	3.00	0.66	7.2	0.39	0.72	0.24	0.18	0.15	0.03
20.....	2.05	2.00	0.65	6.7	0.35	0.40	0.24	0.18	0.15	0.03
21.....	2.00	1.00	0.60	4.9	0.34	0.38	0.24	0.18	0.15	0.03
22.....	2.00	1.00	0.55	3.4	0.32	0.34	0.24	0.18	0.15	0.03
23.....	1.97	0.85	0.50	2.3	0.32	0.34	0.23	0.16	0.14	0.02
24.....	1.94	0.70	0.50	2.3	0.30	0.30	0.23	0.16	0.15	0.03
25.....	1.98	0.90	0.50	2.3	0.30	0.30	0.22	0.14	0.14	0.02
26.....	3.55a	201.00	0.50	2.3	0.28	0.26	0.22	0.14	0.14	0.03
27.....	1.20	30.00	0.45	1.4	0.26	0.22	0.22	0.14	0.14	0.02
28.....	0.90a	21.00	0.45	1.4	0.26	0.22	0.21	0.12	0.14	0.02
29.....	0.78	13.60	0.45	1.4	0.26	0.22	0.20	0.10	0.14	0.02
30.....	0.70	9.10	0.45	1.4	0.26	0.22	0.20	0.10	0.14	0.01
31.....			0.45	1.4	0.24	0.18		0.12	0.12	0.01

a to a Shifting conditions.

## MONTHLY DISCHARGE of Martin Creek near Nordegg, for 1915.

(Drainage area 5 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (12-30).....	201.00	0.70	15.90	3.180	2.25	599
July.....	25.00	1.40	6.10	1.226	1.41	375
August.....	1.40	0.18	0.55	0.110	0.13	34
September.....	0.22	0.10	0.17	0.034	0.04	10
October (1-31).....	0.10	0.10	0.05	0.010	0.01	3
The period.....					3.84	1,021

## SHUNDA CREEK NEAR SAUNDERS.

*Location.*—Tp. 40, Rge. 13, W. 5th Mer., about two and one-half miles southwest of Saunders on the Canadian Northern Railway.

*Records available.*—June 1 to June 30 and from August 4 to November 29, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 90.51 feet since establishment.

*Bench-mark.*—Standard wooden. Located on left bank about 100 feet above the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of sand, gravel and rock.

*Discharge measurements.*—Made from a temporary cable or by wading.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood overflowing its banks and reaching a gauge height of 12.13 feet. The slope method gives a corresponding maximum discharge of 3,426 sec.-ft.

*Observer.*—J. J. Lundy, June 3 to June 24; Wm. Buchner, August 4 to September 26; Thos. Rees, September 27 to December 31.

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## DISCHARGE MEASUREMENTS of Shunda Creek near Saunders, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 3.....	O. H. Hoover.....	53.5	90.2	3.81	2.98	344.0
June 27.....	do.....	83.0	405.4	8.45	12.13	3,426.0a
Aug. 14.....	do.....	45.5	31.3	2.08	1.76	65.0
Sept. 22.....	do.....	48.0	30.4	1.88	1.74	57.0
Nov. 6.....	do.....	32.5	36.2	0.51	1.48	18.6

a Slope measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Shunda Creek near Saunders, for 1915.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.00b	350	.....	.....	.....	.....	1.61	37	1.78	65
2.....	3.06b	366	.....	.....	.....	.....	1.63	40	1.90	87
3.....	2.98	345	.....	.....	.....	.....	1.60	35	1.70	51
4.....	2.90	323	.....	.....	2.22	152	1.58	32	1.68	48
5.....	2.75	282	.....	.....	2.15	138	1.56	29	1.67	46
6.....	2.76a	285	.....	.....	2.10	127	1.69	49	1.75	60
7.....	2.77a	288	.....	.....	2.00	106	1.65	43	1.79	67
8.....	2.78a	291	.....	.....	1.96	98	1.60	35	1.78	65
9.....	2.79a	293	.....	.....	1.90	87	1.72	55	1.78	65
10.....	2.80a	296	.....	.....	1.87	82	1.78	65	1.78	65
11.....	2.81a	299	.....	.....	1.80	69	1.69	49	1.79	67
12.....	2.82a	301	.....	.....	1.78	65	1.70	51	1.78	65
13.....	2.83a	304	.....	.....	1.76	62	1.70	51	1.76	62
14.....	2.84a	307	.....	.....	1.75	60	1.78	65	1.76	62
15.....	2.85a	310	.....	.....	1.72	55	1.73	56	1.76	62
16.....	2.86a	312	.....	.....	1.70	51	1.80	69	1.75	60
17.....	2.87a	315	.....	.....	1.68	48	1.60	35	1.74	58
18.....	2.88a	318	.....	.....	1.72	55	1.69	49	1.74	58
19.....	2.90	323	.....	.....	2.40	193	1.70	51	1.74	58
20.....	2.90	323	.....	.....	2.49	215	1.68	45	1.75	60
21.....	2.75	282	.....	.....	2.13	133	1.67	46	1.75	60
22.....	2.65	256	.....	.....	2.00	106	1.78	65	1.74	58
23.....	2.55	230	.....	.....	1.86	80	1.73	56	1.74	58
24.....	2.55	230	.....	.....	1.78	65	1.75	60	1.75	60
25.....	5.74a	1,162	.....	.....	1.76	62	1.74	58	1.74	58
26.....	8.93a	2,250	.....	.....	1.73	56	1.72	55	1.73	56
27.....	12.13	3,426	.....	.....	1.69	49	1.71	53	1.72	55
28.....	9.26b	2,370	.....	.....	1.67	46	1.70	51	1.70	51
29.....	6.39b	1,370	.....	.....	1.65	43	1.69	49	1.69	49
30.....	3.52b	496	.....	.....	1.64	41	1.69	49	1.69	49
31.....	.....	.....	.....	.....	1.62	38	.....	.....	1.69	49

a Gauge height interpolated.

b' Gauge height estimated.

No observations in July.

DAILY GAUGE HEIGHT AND DISCHARGE of Shunda Creek near Saunders, for 1915—*Concluded.*

DAY.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.68	48.0	2.74	19.3d
2.....	1.63	40.0	2.76	19.7
3.....	1.62	38.0	2.54	20.0
4.....	1.61	37.0	2.39	20.0
5.....	1.59	34.0	2.21	20.0
6.....	1.48	19.0	2.20	19.8
7.....	1.56	29.0	1.56	19.6
8.....	1.50	21.0	1.54	19.2
9.....	1.54	27.0	1.54	19.0
10.....	1.52	24.0	1.52	18.7
11.....	1.50	21.0	1.49	18.5
12.....	1.50	21.0	1.49	18.3
13.....	1.49	20.0	1.48	18.3
14.....	1.48	19.0	1.46	18.3
15.....	1.49	20.0	1.46	18.4
16.....	1.54	20.0c	1.49	18.5
17.....	1.76	20.0	1.52	18.7
18.....	1.89	19.8	1.56	18.8
19.....	1.92	19.7	1.59	19.0
20.....	1.92	19.5	1.59	19.0
21.....	2.00	19.5	1.56	18.8
22.....	2.00	19.5	1.53	18.7
23.....	2.10	19.6	1.53	18.4
24.....	2.00	19.5	1.53	18.3
25.....	1.98	19.5	1.49	18.2
26.....	1.92	19.2	1.49	18.0
27.....	1.85	19.0	1.47	17.8
28.....	1.75	19.0	1.47	17.5
29.....	1.89	19.0	1.46	17.2
30.....	2.70	19.0	1.46	16.5
31.....			1.46	15.7

c Ice conditions after Nov. 16.

d Discharge approximate during December.

## MONTHLY DISCHARGE of Shunda Creek near Saunders, for 1915.

(Drainage area 120 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (1-30).....	3,426	230.0	610.0	5.080	5.67	36,303
July.....						
August (4-31).....	215	38.0	85.0	0.708	0.74	4,725
September.....	65	29.0	50.0	0.417	0.46	2,975
October.....	87	46.0	59.0	0.492	0.57	3,640
November.....	48	19.0	23.7	0.198	0.22	1,410
December (1-31).....	20	15.7	18.6	0.155	0.18	1,144
The period.....					7.84	50,197

## NORTH SASKATCHEWAN RIVER NEAR SAUNDERS.

*Location.*—Sec. 14, Tp. 40, Rge. 13, W. 5th Mer., about two miles southwest of Saunders on the Canadian Northern Railway.

*Records available.*—August 4, to December 3, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 81.18 feet since establishment.

*Bench-mark.*—Standard wooden. Located on the left bank 104 feet above cable. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of gravel, stones and rock.

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*Discharge measurements.*—Made from a cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood overflowing its banks and reaching a gauge height of 15.62 feet. The slope method gives a corresponding maximum discharge of 43,841 sec.-ft.

*Observer.*—Wm. Buchner, August 4 to September 26; Thos. Rees, September 27 to December 31.

## DISCHARGE MEASUREMENTS of North Saskatchewan River near Saunders, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 27 and 28.....	O. H. Hoover.....		4,419	8.70	15.62	43,841 <sup>a</sup>
Aug. 13.....	do.....	284	1,851	6.20	6.87	11,467
Aug. 13.....	do.....	284	1,879	6.30	7.00	11,830
Sept. 22.....	do.....	276	766	3.55	3.51	2,720
Nov. 8.....	do.....	244	363	2.49	2.00	903

<sup>a</sup> Slope measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River near Saunders, for 1915.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			6.80	11,230	3.29	2,414	2.70	1,580	2.19	1,061 <sup>b</sup>
2.....			6.23	9,604	3.35	2,515	2.69	1,568	2.19	1,061
3.....			6.00	8,960	3.34	2,498	2.50	1,350	2.45	1,060 <sup>a</sup>
4.....	7.90	14,500	6.10	9,240	3.22	2,302	2.45	1,300	2.57	1,040
5.....	7.40	13,000	6.00	8,960	3.20	2,270	2.39	1,241	2.69	1,030
6.....	7.20	12,400	5.80	8,400	3.13	2,165	2.20	1,070	2.69	1,005
7.....	7.30	12,700	5.39	7,273	3.00	1,970	2.00	900	2.72	980
8.....	7.20	12,400	5.00	6,220	3.00	1,970	2.00	900	2.78	950
9.....	7.25	12,550	4.60	5,200	2.98	1,942	1.98	886	2.83	910
10.....	7.30	12,700	4.38	4,672	2.95	1,900	1.98	886	2.90	880
11.....	7.10	12,100	4.20	4,250	2.94	1,886	2.00	900	2.92	850
12.....	7.15	12,250	4.06	3,932	2.94	1,886	2.00	900	2.95	835
13.....	7.00	11,810	3.20	2,270	2.86	1,778	2.00	900	3.46	835
14.....	7.10	12,100	3.10	2,120	2.86	1,778	2.00	900	3.49	838
15.....	7.20	12,400	3.05	2,045	2.86	1,778	2.14	1,016	4.63	838
16.....	7.23	12,490	3.00	1,970	2.85	1,765	2.16	1,084	4.87	820
17.....	7.10	12,100	2.80	1,700	2.84	1,752	2.16	1,034	5.00	825
18.....	7.50	13,300	2.50	1,350	2.84	1,752	2.19	1,061	5.00	835
19.....	8.10	15,100	3.00	1,970	2.82	1,726	2.19	1,061	5.10	840
20.....	8.30	16,700	3.20	2,270	2.80	1,700	2.21	1,079	4.98	845
21.....	7.70	13,900	3.90	3,580	2.80	1,700	2.24	1,106	4.96	845
22.....	7.58	13,540	3.51	2,799	2.79	1,688	2.20	1,070	4.96	830
23.....	7.36	12,880	3.45	2,690	2.80	1,700	2.18	1,052	4.96	825
24.....	7.30	12,700	3.72	3,210	2.79	1,688	2.16	1,044	4.89	820
25.....	7.20	12,400	3.53	2,837	2.79	1,688	2.13	1,007	4.88	815
26.....	7.10	12,100	3.48	2,744	2.77	1,664	2.13	1,007	4.79	800
27.....	7.00	11,810	3.42	2,636	2.77	1,664	2.15	1,025	4.79	780
28.....	6.80	11,230	3.40	2,600	2.74	1,628	2.15	1,025	4.19	780
29.....	6.86	11,404	3.35	2,515	2.73	1,616	2.19	1,061	4.16	780
30.....	7.00	11,810	3.29	2,414	2.73	1,616	2.14	1,016	4.00	710
31.....	7.05	11,955			2.73	1,604			4.00	700

<sup>a</sup> Ice conditions.

<sup>b</sup> Discharges approximate during December.

## MONTHLY DISCHARGE of North Saskatchewan River near Saunders, for 1915.

(Drainage area 1,689 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
August (4-31).....	15,700	11,230	12,690	7.510	7.82	704,600
September.....	11,230	1,350	4,389	2.600	2.90	261,164
October.....	2,515	1,604	1,871	1.110	1.28	115,043
November.....	1,580	886	1,066	0.631	0.70	63,431
December (1-31).....	1,061	690	869	0.514	0.59	53,433
The period.....					13.29	1,197,671

## RAM RIVER.

*Location.*—Tp. 39, Rge. 11, W. 5th Mer., about one and one-half miles above the stream mouth.

*Records available.*—Discharge measurements only.

*Gauge.*—None established.

*Bench-mark.*—Standard wooden: Located on the right bank near Forestry trail, about 100 yards above gauging section. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of sand, gravel and shale.

*Discharge measurements.*—Made by wading or from a temporary cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood overflowing its banks, and reaching an elevation of 100.95 feet relative to bench-mark. The slope method gives a corresponding maximum discharge of 33,579 sec.-ft.

*Observer.*—None obtainable.

## DISCHARGE MEASUREMENTS of Ram River in Tp. 39, Rge. 11, W. 5th Mer., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27.....	O. H. Hoover.....	338	2,869	11.704	99.86b	33,579a
Aug. 10.....	do .....	166	327	3.290	90.70b	1,076
Sept. 25.....	do .....	157	276	2.570	90.46b	710

a Slope measurement.

b Water surface elevation.

## CLEARWATER RIVER NEAR ROCKY MOUNTAIN HOUSE.

*Location.*—On SE.  $\frac{1}{4}$  sec. 16, Tp. 39, Rge. 7, W. 5th Mer., on G. Fletcher's farm, three miles southwest of Rocky Mountain House.

*Records available.*—January 1, 1914, to December 31, 1915.

*Gauges.*—Chain gauge, located on left bank of river 60 feet upstream from the cable. There is a staff gauge on the right bank of the river, and in the same section which is used by the observer during the open water season. The zero elevation of the gauges has been maintained at 3,105.04 feet since establishment.

*Bench-marks.*—On nails in a poplar stump directly in front of cable tower on the right bank. Elevation, 3,120.00 feet. (Department of Public Works of Canada datum.) On June 4th, 1915, a permanent iron bench-mark was set 3 feet upstream from the cable tower on the right bank. Its elevation is 3,118.39 feet and is referred to the old datum.

*Channel.*—One permanent channel at low water and probably two in high stages.

*Discharge measurements.*—Made from a cable car.

*Winter flow.*—Stream affected by ice from November to April and measurements are made 300 feet below the cable section.



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*Floods.*—In the latter part of June, 1915, this stream was in violent flood and rose about 14 feet in 36 hours. At a gauge height of 15 feet it overflowed the left bank and did considerable damage to low lying farm lands. The maximum gauge height of 18.08 feet was reached on June 27. During the flood the cables and gauges were carried downstream. The main cable was recovered and the station re-erected on July 8.

*Observer.*—G. Fletcher.

## DISCHARGE MEASUREMENTS of Clearwater River near Rocky Mountain House, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 15.....	H. S. Kerby.....	155a	323	0.53	2.28	171
Feb. 5.....	do.....	143a	306	0.66	2.45	200
Feb. 26.....	H. W. Rowley.....	155a	289	0.64	2.51	184
Mar. 18.....	R. J. McGuinness.....	165a	371	0.77	3.05	286
April 15.....	I. R. Strome.....	175	432	0.69	1.47	302
May 3.....	do.....	184	492	0.93	1.90	455
May 19.....	do.....	196	816	2.30	3.47	1,579
June 10.....	do.....	198	930	2.88	4.12	2,680
July 9.....	do.....	210	1,290	3.15	5.29	4,059
Aug. 6.....	do.....	209	1,110	2.71	4.56	3,009
Sept. 4.....	do.....	203	915	2.12	3.72	1,939
Sept. 23.....	do.....	201	802	1.66	3.22	1,330
Oct. 7.....	do.....	200	776	1.57	3.06	1,217
Oct. 26.....	do.....	196	697	1.25	2.67	871
Dec. 3.....	F. K. Beach.....	225a	536	1.10	4.09	590
Dec. 29.....	do.....	219a	342	0.87	3.93	305

a Ice conditions.

## DAILY GAUGE HEIGHT AND DISCHARGE of Clearwater River near Rocky Mountain House, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.00	160a	2.28	188	2.55	197	2.46	295	1.80	480	3.72	2,164
2.....	2.00	162	2.33	185	2.60	192	2.36	298	1.85	510	3.97	2,464
3.....	2.01	162	2.38	184	2.60	188	2.26	304	1.95	570	5.00	3,875
4.....	2.02	162	2.37	191	2.61	190	2.21	320a	2.28	799	4.70	3,430
5.....	2.13	162	2.37	200	2.61	198	1.78	375c	2.82	1,238	4.30	2,890
6.....	2.24	161	2.37	209	2.61	197	1.71	430	2.91	1,319	4.18	2,784
7.....	2.25	162	2.42	212	2.67	193	1.66	405	2.93	1,337	4.08	2,604
8.....	2.26	162	2.47	212	2.67	192	1.58	365	2.92	1,328	4.01	2,513
9.....	2.27	162	2.51	212	2.67	198	1.56	355	3.04	1,440	4.16	2,768
10.....	2.28	163	2.51	210	2.68	204	1.56	355	2.97	1,373	4.12	2,656
11.....	2.29	165	2.56	200	2.68	209	1.52	335	2.79	1,211	4.32	2,916
12.....	2.35	166	2.56	193	2.68	219	1.49	320	2.63	1,079	4.28	2,864
13.....	2.36	168	2.55	187	2.68	225	1.47	313	2.74	1,167	4.25	2,825
14.....	2.37	170	2.45	186	2.69	235	1.47	313	3.09	1,490	4.15	2,695
15.....	2.32	171	2.44	187	2.69	249	1.47	313	3.82	2,284	4.18	2,734
16.....	2.22	181	2.39	190	2.84	261	1.47	313	3.94	2,428	4.25	2,825
17.....	2.21	200	2.39	190	2.90	272	1.48	317	3.53	1,936	4.25	2,825
18.....	2.31	205	2.34	193	3.05	286	1.48	317	3.49	1,890	4.62	3,418
19.....	2.41	206	2.38	197	3.05	295	1.49	321	3.47	1,870	4.30	2,890
20.....	2.40	203	2.62	199	3.05	300	1.49	321	3.40	1,800	4.22	2,786
21.....	2.40	198	2.51	200	3.05	301	1.61	380	3.40	1,800	4.05	2,565
22.....	2.30	192	2.46	193	3.05	302	1.63	390	3.50	1,900	3.95	2,440
23.....	2.30	188	2.40	190	3.05	302	1.63	390	3.48	1,880	3.95	2,440
24.....	2.29	182	2.49	184	3.10	298	1.63	390	3.53	1,936	4.02	2,528
25.....	2.39	180	2.48	183	3.05	296	1.67	410	3.64	2,068	4.65	3,081
26.....	2.29	176	2.47	184	2.25	286	1.75	450	3.81	2,272	10.55a	15,800
27.....	2.29	174	2.48	188	2.30	279	1.69	420	3.74	2,188	17.58a	26,100
28.....	2.29	172	2.54	194	2.35	277	1.68	415	3.84	1,948	15.02	16,000
29.....	2.29	171			2.40	278	1.69	420	3.44	1,840	9.48	12,760
30.....	2.28	172			2.45	281	1.69	420	3.99	2,488	8.72	9,600
31.....	2.28	178			2.50	292			3.82	2,284		

a to a Ice conditions.

b to b Gauge washed out; water surface marked by stakes.

c Maximum gauge height 18.08 feet.

d Discharge interpolated.

## DAILY GAUGE HEIGHT AND DISCHARGE of Clearwater River near Rocky Mountain House, for 1915.

—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	7.40b	7,840	5.17	3,855	4.01	2,238	3.09	1,240	2.70	885	3.95	607
2.....	6.86	6,759	5.12	3,780	3.98	2,203	3.09	1,240	2.70	885	4.00	595
3.....	6.00	5,175	5.02	3,630	3.83	2,238	3.16	1,310	2.68	869	4.12	590
4.....	5.69	4,679	4.92	3,488	3.73	1,928	3.19	1,340	2.65	845	4.10	570
5.....	5.69	4,679	4.78	3,292	3.63	1,818	3.14	1,290	2.60	805	4.23	555
6.....	5.69	4,679	4.58	3,012	3.63	1,818	3.12	1,270	2.63	829	4.15	539
7.....	5.80b	4,855	4.48	2,872	3.58	1,763	3.05	1,200	2.65	845	4.00	523
8.....	5.50	4,375	4.41	2,774	3.53	1,708	2.98	1,132	2.66	853	4.01	520
9.....	5.28	4,023	4.43	2,802	3.58	1,763	2.88	1,042	2.72	901	4.14	521
10.....	5.20	3,900	4.35	2,690	3.58	1,763	2.92	1,078	2.78	952	4.03	505
11.....	4.98	3,572	4.18	2,459	3.48	1,653	3.00	1,150	2.92	912f	3.86	502
12.....	4.72	3,208	4.03	2,264	3.43	1,598	2.95	1,105	3.04	862f	3.85	492
13.....	4.79	3,306	4.03	2,264	3.35	1,510	2.88	1,042	3.03	812f	3.85	475
14.....	6.04	5,246	3.93	2,148	3.33	1,488	2.88	1,015	3.24	762d	3.97	458
15.....	9.40	12,540	3.93	2,148	3.31	1,466	2.80	970	3.60	741	4.08	450
16.....	8.31	9,863	3.98	2,203	3.33	1,488	2.78	952	4.12	736	4.09	452
17.....	8.21	9,633	3.93	2,148	3.33	1,488	2.75	925	4.13	730	4.00	457
18.....	9.01	11,526	3.91	2,126	3.33	1,488	2.76	934	3.34	725	3.96	460
19.....	7.96	9,062	4.35	2,680	3.33	1,488	2.78	952	3.35	718	3.82	463
20.....	7.26	7,546	5.43	4,263	3.31	1,466	2.76	934	3.36	713	3.80	455
21.....	6.81	6,664	8.38	10,024	3.28	1,433	2.75	925	3.77	718	3.89	427
22.....	8.36	9,978	6.13	5,409	3.25	1,400	2.72	901	3.78	711	4.01	432
23.....	6.13	5,409	5.35	4,135	3.23	1,380	2.70	885	3.79	700	4.01	425
24.....	5.86	4,953	5.01	3,615	3.23	1,380	2.69	877	3.80	673	4.00	408
25.....	5.53	4,423	4.75	3,250	3.28	1,433	2.66	853	3.81	651	4.00	387
26.....	5.44	4,277	4.58	3,012	3.23	1,380	2.65	845	3.83	642	4.09	382
27.....	5.22	3,930	4.38	2,732	3.18	1,330	2.66	853	3.85	633	4.10	362
28.....	5.04	3,660	4.23	2,524	3.13	1,280	2.66	853	3.91	621	4.14	330
29.....	5.54	4,439	4.15	2,420	3.13	1,280	2.66	853	3.98	622	3.93	305
30.....	5.37	4,167	4.05	2,290	3.08	1,230	2.66	853	4.04	622	3.96	305
31.....	5.22	3,930	4.03	2,264	.....	.....	2.70	885	.....	.....	3.97	312d

b to b Gauge washed out; water surface marked by stakes.

d to d Ice conditions.

River freezing up; discharge interpolated.

## MONTHLY DISCHARGE of Clearwater River near Rocky Mountain House, for 1915.

(Drainage area 881 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	206	160	175	0.199	0.23	10,760
February.....	212	183	194	0.220	0.23	10,774
March.....	302	188	248	0.282	0.33	15,249
April.....	450	295	359	0.407	0.45	21,362
May.....	2,488	480	1,618	1.840	2.12	99,490
June.....	39,100	2,164	5,688	6.460	7.21	338,460
July.....	12,540	3,208	5,881	6.680	7.70	361,610
August.....	10,024	2,126	3,180	3.610	4.16	195,530
September.....	2,238	1,230	1,590	1.800	2.01	94,610
October.....	1,340	845	1,023	1.160	1.34	62,903
November.....	952	621	766	0.869	0.97	45,580
December.....	607	305	460	0.522	0.60	28,284
The year.....	.....	.....	.....	.....	27.35	1,284,612

## SESSIONAL PAPER No. 25c

## NORTH SASKATCHEWAN RIVER NEAR ROCKY MOUNTAIN HOUSE.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 21, Tp. 39, Rge. 7, W. 5th Mer., 2,000 feet below the railway bridge and one mile west of Rocky Mountain House.

*Records available.*—From June 2, 1913, to December 31, 1915.

*Gauge.*—Inclined staff graduated to feet and tenths. From June 2, 1913, to June 27, 1915, located 1,200 feet above the cable on the left bank. Zero elevation maintained at 3,108.39 feet from June 2, 1913, to October 23, 1913. Zero elevation maintained at 3,108.42 feet from October 23, 1913, to June 27, 1915. After June 28, 1915, the gauge was located 20 feet below the cable, on the left bank and has been maintained at a zero elevation of 3,108.47 feet.

*Bench-marks.*—On nails in a spruce tree, on the north side of the road allowance, on the left bank of the river and 50 feet from the edge of the bank; elevation 3,126.93 feet. (Department of Public Works of Canada datum.) On October 8, 1915, a permanent iron bench-mark was set on the left bank 3 feet above the cable tower. Elevation, 3,125.96 feet. (Department of Public Works of Canada datum.)

*Channel.*—One channel at all stages.

*Discharge measurements.*—Made from a cable car.

*Winter flow.*—Stream affected by ice from November to April and measurements made 1,400 feet above the cable section.

*Floods.*—In the latter part of June, 1915, this stream was in violent flood and rose 14 feet in about 36 hours. At a gauge height of 14.0 feet the right bank overflowed and at a gauge height of 18.0 feet the left bank overflowed. Considerable damage was done to low lying farm lands along the river. A maximum gauge height of 23.38 feet was reached on June 27. During this flood the gauge and cables were swept away. A new gauge was put in at once but owing to the high water stage, existing all summer, the new cable was not put in place until early in September, which accounts for the fact that there were no gaugings taken between June 11 and September 8, 1915.

*Observer.*—Wm. Austin.

## DISCHARGE MEASUREMENTS of North Saskatchewan River near Rocky Mountain House, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 14.	H. S. Kerby	405a	672	1.23	6.30	824
Feb. 4.	do	405a	528	1.51	6.34	795
Feb. 25.	do	410a	461	1.52	5.82	702
Mar. 17.	R. J. McGuinness	405a	404	1.56	6.40	631
April 14.	I. R. Strome	421	668	2.11	4.07	1,406
May 3.	do	426	846	2.70	4.58	2,282
May 20.	do	434	1,419	3.94	6.05	5,592
May 28.	O. H. Hoover	440	1,623	4.51	6.72	7,318
June 11.	I. R. Strome	443	2,054	5.28	7.68	10,852
Sept. 8.	do	512b	1,909	4.21	5.60	8,043
Sept. 24.	do	510	1,456	3.53	4.70	5,148
Oct. 7.	do	510	1,246	3.16	4.23	3,941
Oct. 26.	do	506b	1,055	2.98	3.70	3,141
Dec. 2.	F. K. Beach	407a	1,196	1.12	5.24	1,335
Dec. 28.	do	405a	1,305	1.08	5.41	1,411

\*Gauging equipment carried away by flood June 26, 1915.

a Ice conditions.

b to b New gauge datum; separate curve.

## DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River near Rocky Mountain House, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1. ....	6.30	875a	6.13	791	6.00	687	6.34	850	4.44	2,052	6.60	7,180
2. ....	6.45	872	6.23	795	6.10	682	6.39	852	4.47	2,106	7.48	10,108
3. ....	6.40	875	6.13	795	6.15	683	6.39	900	4.54	2,232	8.22	13,026
4. ....	6.50	875	6.29	795	6.20	683	6.44	940	4.75	2,625	7.65	10,730
5. ....	6.35	870	6.34	798	6.15	680	6.44	1,010	5.12	3,372	7.52	10,252
6. ....	6.30	860	6.34	791	6.15	670	5.28	1,250b	5.18	3,498	7.42	9,892
7. ....	6.20	855	6.29	788	6.15	665	4.78	1,490b	5.40	4,900	7.30	9,470
8. ....	6.15	845	6.24	788	6.10	660	4.25	1,725	5.80	4,980	7.55	10,360
9. ....	6.40	840	6.29	786	6.00	655	4.15	1,560	6.20	6,040	7.52	10,252
10. ....	6.50	847	6.34	780	6.15	650	4.18	1,608	6.35	6,460	7.52	10,252
11. ....	6.45	843	6.34	779	6.20	640	3.95	1,250	6.42	6,658	7.68	10,844
12. ....	6.40	837	6.29	771	6.20	640	3.99	1,306	6.12	5,824	7.62	10,616
13. ....	6.40	830	6.34	762	6.25	638	3.98	1,292	6.00	5,500	7.68	10,844
14. ....	6.30	824	6.29	752	6.30	630	4.08	1,448	6.25	6,180 <sup>c</sup>	7.88	11,620
15. ....	6.25	822	6.19	740	6.25	627	3.99	1,306	6.50	6,890	7.82	11,380
16. ....	6.20	822	6.24	730	6.35	627	3.98	1,292	6.55	7,035	8.00	12,100
17. ....	6.25	824	6.34	732	6.35	630	4.05	1,400	6.22	6,096	8.42	13,886
18. ....	6.30	832	6.29	737	6.45	640	4.11	1,496	6.10	5,770	8.68	15,012
19. ....	6.40	840	6.24	733	6.55	650	4.18	1,608	6.02	5,554	8.35	13,585
20. ....	6.35	839	6.29	730	6.55	660	4.21	1,657	6.05	5,635	8.22	13,026
21. ....	6.30	837	6.29	721	6.65	672	4.31	1,827	6.28	6,264	8.12	12,604
22. ....	6.20	834	6.09	718	6.65	688	4.25	1,725	6.60	7,180	7.92	11,780
23. ....	6.20	830	6.14	715	6.70	703	4.25	1,725	6.62	7,242	7.98	12,020
24. ....	6.15	825	6.24	710	6.60	720	4.21	1,657	6.60	7,180	8.20	12,940
25. ....	6.10	819	5.79	702	6.55	732	4.21	1,657	6.80	7,800	9.30	17,830
26. ....	6.12	810	5.84	700	6.40	727	4.28	1,776	7.08	8,712	14.10	48,100
27. ....	5.72	800	5.94	698	6.35	707	4.28	1,776	6.95	8,280	22.10c	129,700
28. ....	6.42	793	6.04	695	6.40	710	4.25	1,725	6.68	7,428	20.80	115,600
29. ....	5.62	785	.....	.....	6.35	730	4.18	1,608	7.00	8,440	14.40	58,000
30. ....	5.92	785	.....	.....	6.30	780	4.31	1,827	7.18	9,052	12.40c	43,800
31. ....	6.02	787	.....	.....	6.30	847	.....	.....	6.82	7,864	.....	.....

a to a Ice conditions.

b Ice going out. Discharge interpolated.

c to c Gauge heights interpolated. Gauge washed out. High water mark, 23.38 feet, June 27th. Maximum discharge estimated to be 145,000 sec.-feet.

## SESSIONAL PAPER No. 25C

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River near Rocky Mountain House, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	10.80c	33,600	8.08	18,500	6.70	12,400	4.43	4,575	3.62	3,030	5.10	1,340
2.....	9.40	25,400	7.90	17,650	6.57	11,880	4.53	4,823	3.60	3,000	5.23	1,335
3.....	9.20	24,300	8.05	18,350	6.53	11,720	4.57	4,925	3.55	2,925	5.50	1,330
4.....	9.10	23,750	8.28	19,500	6.25	10,600	4.53	4,825	3.58	2,970	6.10	1,325
5.....	9.10c	23,750	7.88	17,560	6.15	10,200	4.43	4,575	3.52	2,850	6.45	1,320
6.....	9.04	23,420	7.52	15,940	6.17	10,280	4.35	4,387	3.50	2,850	6.50	1,330
7.....	8.84	22,320	7.48	15,760	6.10	10,000	4.25	4,162	3.40	2,700	5.95	1,330
8.....	8.87	22,485	7.52	15,940	5.65	8,238	4.20	4,050	3.30	2,575	6.25	1,325
9.....	8.20	19,100	7.50	15,850	5.53	7,788	4.08c	3,810	3.32	2,600	6.20	1,320
10.....	7.96	17,920	7.40	15,400	5.30	6,950	4.08	3,810	3.10	2,350	6.05	1,330
11.....	7.53	15,985	7.25	14,725	5.15	6,500	4.02	3,690	7.07	2,250f	5.90	1,335
12.....	7.48	15,760	7.12	14,140	4.93	5,858	4.00	3,690	8.20	2,120	5.70	1,350
13.....	8.80	17,200	7.10	14,050	4.97	5,967	4.05	3,750	8.00	2,015	5.55	1,325
14.....	11.05	35,100	7.18	14,410	4.87	5,692	3.92	3,510	7.70	1,945	5.50	1,320
15.....	9.85	27,900	7.15d	14,275	4.87	5,692	3.82	3,335	7.45	1,595	5.40	1,330
16.....	10.00	28,800	7.20	14,500	4.80	5,500	3.82	3,335	6.75	1,820	5.25	1,310
17.....	11.25	36,325	7.30	14,950	4.77	5,425	3.82	3,335	6.35	1,750	5.05	1,310
18.....	10.65	32,700	7.37	15,265	4.80	5,500	3.85	3,388	6.45	1,680	4.95	1,345
19.....	9.62	26,610	8.15	18,500	4.83	5,583	3.82	3,335	6.15	1,460	5.20	1,390
20.....	9.25	24,575	9.00	23,200	4.87	5,692	3.85	3,388	6.00	1,410	5.35	1,425
21.....	8.85	22,375	9.75	27,325	4.87	5,692	3.88	3,440	6.00	1,390	5.50	1,435
22.....	8.65	21,350	9.15	24,025	4.77	5,425	3.82	3,335	5.95	1,380	5.65	1,415
23.....	8.52	20,700	8.05	18,350	4.77	5,425	3.80	3,300	6.00	1,370	5.60	1,395
24.....	8.18	19,000	7.85	17,425	4.75	5,375	3.78	3,270	6.10	1,360	5.50	1,410
25.....	7.82	17,290	7.70	16,750	4.67	5,175	3.78	3,270	5.90	1,350	5.65	1,420
26.....	7.70	16,750	7.50	15,850	4.67	5,175	3.70	3,150	5.35	1,340	5.55	1,420
27.....	7.58	16,210	7.33	15,085	4.63	5,075	3.72	3,180	6.10	1,340	5.40	1,410
28.....	7.48	15,760	7.17	14,365	4.53	4,825	3.75	3,225	5.60	1,350	5.40	1,410
29.....	8.05	18,350	7.00	13,600	4.47	4,675	3.72	3,180	5.80	1,365	5.35	1,410
30.....	7.75	16,975	7.07	13,915	4.45	4,625	3.70	3,150	5.45	1,355	5.20	1,415
31.....	7.90	17,650	7.05	13,825	.....	.....	3.68	3,120	.....	.....	5.25	1,425f

c to c Gauge heights interpolated.

d Temporary gauge installed at cable section.

e New gauge placed and gauge heights June 28 to Oct. 8 reduced to datum of new gauge.

f to f Ice conditions.

## MONTHLY DISCHARGE of North Saskatchewan River near Rocky Mountain House, for 1915.

(Drainage area 4,050 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
January.....	878	785	833	0.206	0.238	51,219
February.....	708	698	751	0.185	0.193	41,728
March.....	847	627	681	0.168	0.194	41,873
April.....	1,827	850	1,451	0.358	0.399	86,340
May.....	9,052	2,052	5,944	1.465	1.689	384,868
June.....	129,700	7,180	22,804	5.633	6.302	1,362,246
July.....	36,325	15,760	22,562	5.571	6.411	1,387,182
August.....	27,325	13,600	16,753	4.137	4.707	1,096,089
September.....	12,400	4,625	6,964	1.730	1.911	464,780
October.....	4,925	3,120	1,086	0.910	1.049	26,642
November.....	3,030	1,340	1,094	0.492	0.540	118,643
December.....	1,435	1,310	1,084	0.337	0.388	88,868
The year.....					24.117	8,296,188

## SOUTHESK RIVER.

*Location.*—Tp. 43, Rge. 20, W. 5th Mer., about five miles above mouth of stream. at Forestry ford.

*Records available.*—Discharge measurements only.

*Gauge.*—None established.

*Bench-mark.*—Standard wooden. Located on the left bank about 50 feet downstream from trail. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of sand, gravel and rock.

*Discharge measurements.*—Made from a temporary cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood but did not overflow its banks. An elevation of 94.81 feet relative to bench-mark was reached. The slope method gives a corresponding discharge of 3,835 sec.-ft.

*Observer.*—None obtainable.

## DISCHARGE MEASUREMENTS of Southesk River in Tp. 43, Rge. 20, W. 5th Mer., in 1916.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27.....	O. H. Hoover.....	103	510.3	7.52	94.81 <sup>b</sup>	3,835 <sup>a</sup>
Sept. 2.....	do.....	72	105.0	4.40	91.05 <sup>b</sup>	462

<sup>a</sup> Slope measurement.

<sup>b</sup> Water surface elevation.

## SOUTH BRANCH OF BRAZEAU RIVER.

*Location.*—Tp. 43, Rge. 16, W. 5th Mer., about one-half mile above mouth of Chungo Creek.

*Records available.*—Discharge measurements only.

*Gauge.*—None established.

*Bench-mark.*—Standard wooden. Located on the left bank, 60 feet from water edge, and 30 feet upstream from gauging section. Assumed elevation, 100.00 feet.

*Channel.*—Shifting, consisting of sand and gravel.

*Discharge measurements.*—Made by wading or from a temporary cable.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood, overflowing its banks and reaching a gauge height elevation of 100.95 feet relative to bench-mark. The slope method gives a corresponding maximum discharge of 30,424 sec.-ft.

*Observer.*—None obtainable.

## DISCHARGE MEASUREMENTS of South Branch Brazeau River in Tp. 43, Rge. 16, W. 5th Mer., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27.....	O. H. Hoover.....	198	2130.2	14.28	100.95 <sup>b</sup>	30,424 <sup>a</sup>
Aug. 27.....	do.....	134	170.0	1.95	94.57 <sup>b</sup>	331

<sup>a</sup> Slope measurement.

<sup>b</sup> Water surface elevation.

## CHUNGO CREEK.

*Location.*—Tp. 43, Rge. 17, W. 5th Mer., about 500 feet above stream mouth.

*Records available.*—Discharge measurements only.

*Gauge.*—None established.

*Bench-mark.*—Standard wooden. Located on the right bank about 30 feet from water edge, and on a line with measuring section. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of sand, gravel and rock.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood but did not overflow its banks. A maximum elevation of 95.41 feet relative to bench-mark was reached. The slope method gives a corresponding discharge of 9,351 sec.-ft.

*Observer.*—None obtainable.





Brazeau River in Sec. 34, Tp. 44, Rge. 15, West 5th Meridian. (Note the high water marks.)  
Taken on September 1, 1915, by O. H. Hoover.



Flood debris and large gravel wash on Brazeau River, in Sec. 34, Tp. 44, Rge. 15,  
West 5th Meridian. Taken on August 24, 1915, by O. H. Hoover.





## SESSIONAL PAPER No. 25c

DISCHARGE MEASUREMENTS of Chungo Creek in Tp. 43, Rge. 17, W. 5th Mer., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27.....	O. H. Hoover.....	101.0	843.7	11.07	95.41b	9,351a
Aug. 26.....	do .....	41.2	57.6	1.20	86.78b	69

a Slope measurement.

b Water surface elevation.

## BROWN CREEK.

*Location.*—Tp. 44, Rge. 17, W. 5th Mer., about five miles above stream mouth near Forestry ford.

*Records available.*—Discharge measurements only.

*Gauge.*—None established.

*Bench-mark.*—Standard wooden. Located on the left bank, 50 feet below gauging section. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, consisting of sand, gravel and rock.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Stream affected by ice from November to May.

*Floods.*—During June, 1915, stream was in a violent state of flood but did not overflow its banks. A maximum elevation of 95.58 feet relative to bench-mark was reached. The slope method gives a corresponding discharge of 11,982 sec.-ft.

*Observer.*—None obtainable.

DISCHARGE MEASUREMENTS of Brown Creek in Tp. 44, Rge. 17, W. 5th Mer., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 27.....	O. H. Hoover.....	143.0	881.0	13.60	95.58b	11,982a
Aug. 28.....	do .....	59.5	47.8	0.88	88.94b	42

a Slope measurement.

b Water surface elevation.

## NORTH SASKATCHEWAN RIVER AT ROCKY RAPIDS.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 10, Tp. 49, Rge. 7, W. 5th Mer.,

*Records available.*—Data supplied by Sir John Jackson (Canada) Company, Limited, from June 10, 1913, to May 2, 1914. Records by this office, January 1, 1915, December 31, 1915.

*Gauge.*—Vertical staff on left bank. Zero elevation maintained at 88.30 feet from November 15, to December 31, 1915.

*Bench-mark.*—On five-inch spike in stump near gauge. Assumed elevation, 100.00 feet.

*Maximum stage.*—June 27, 1915, with gauge height of 26.86 feet.

*Accuracy.*—The records given herewith are based on those of the Sir John Jackson (Canada) Company, Limited, and our records at Edmonton. In using these records, therefore, it should be borne in mind that they are only estimates based on very meagre information.

*Observer.*—W. H. Kew.

*Note.*—The cable constructed by the Sir John Jackson (Canada) Company as well as all equipment installed by this office were destroyed in the June-July floods of 1915. A new cable station with complete equipment is being established early in 1916 and complete records will be obtained throughout the year.

## DISCHARGE MEASUREMENTS of North Saskatchewan River at Rocky Rapids, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 20.....	H. B. R. Thompson.....	277	1,076	1.26	.....	1,364
Jan. 21.....	do .....	277	1,076	1.25	.....	1,347
Mar. 8.....	do .....	255	870	1.26	.....	1,093
Mar. 9.....	do .....	255	870	1.27	.....	1,100
Dec. 21.....	J. M. Paul.....	416	2,513	0.62	5.50	1,559

## DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Rocky Rapids, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	1,300	.....	1,300	.....	1,100	.....	2,400	.....	3,700	.....	19,100
2.....	.....	1,300	.....	1,300	.....	1,100	.....	2,500	.....	3,700	.....	23,000
3.....	.....	1,300	.....	1,200	.....	1,100	.....	2,800	.....	4,100	.....	40,000
4.....	.....	1,350	.....	1,200	.....	1,100	.....	3,000	.....	4,000	.....	37,000
5.....	.....	1,300	.....	1,200	.....	1,100	.....	3,500	.....	4,600	.....	29,000
6.....	.....	1,300	.....	1,300	.....	1,100	.....	3,900	.....	5,900	.....	24,200
7.....	.....	1,250	.....	1,300	.....	1,050	.....	4,300	.....	6,200	.....	21,500
8.....	.....	1,250	.....	1,300	.....	1,000	.....	4,900	.....	6,800	.....	22,500
9.....	.....	1,300	.....	1,300	.....	1,100	.....	4,700	.....	7,500	.....	44,000
10.....	.....	1,300	.....	1,200	.....	1,100	.....	3,500	.....	8,500	.....	40,000
11.....	.....	1,200	.....	1,200	.....	1,200	.....	3,500	.....	9,000	.....	36,100
12.....	.....	1,200	.....	1,200	.....	1,200	.....	3,500	.....	9,000	.....	32,700
13.....	.....	1,200	.....	1,300	.....	1,300	.....	3,300	.....	8,200	.....	29,500
14.....	.....	1,200	.....	1,200	.....	1,400	.....	3,300	.....	7,500	.....	26,800
15.....	.....	1,200	.....	1,200	.....	1,400	.....	3,300	.....	9,600	.....	25,400
16.....	.....	1,200	.....	1,200	.....	1,400	.....	3,200	.....	11,300	.....	23,100
17.....	.....	1,250	.....	1,200	.....	1,400	.....	3,200	.....	11,400	.....	30,000
18.....	.....	1,300	.....	1,100	.....	1,500	.....	3,200	.....	9,700	.....	34,500
19.....	.....	1,350	.....	1,200	.....	1,550	.....	3,200	.....	9,000	.....	31,000
20.....	.....	1,360	.....	1,200	.....	1,650	.....	3,500	.....	8,700	.....	28,700
21.....	.....	1,350	.....	1,200	.....	1,800	.....	3,600	.....	8,500	.....	25,700
22.....	.....	1,300	.....	1,200	.....	2,000	.....	3,800	.....	9,000	.....	25,000
23.....	.....	1,300	.....	1,200	.....	2,100	.....	3,900	.....	9,800	.....	24,200
24.....	.....	1,200	.....	1,150	.....	2,150	.....	3,800	.....	10,900	.....	25,600
25.....	.....	1,300	.....	1,150	.....	2,150	.....	3,800	.....	12,300	.....	26,500
26.....	.....	1,300	.....	1,150	.....	2,100	.....	3,800	.....	14,200	.....	55,400
27.....	.....	1,300	.....	1,100	.....	2,200	.....	3,800	.....	15,000	.....	190,500
28.....	.....	1,100	.....	1,100	.....	2,200	.....	3,800	.....	13,000	.....	177,700
29.....	.....	1,100	.....	.....	.....	2,300	.....	3,700	.....	15,000	.....	93,800
30.....	.....	1,100	.....	.....	.....	2,350	.....	3,700	.....	16,000	.....	64,000
31.....	.....	1,200	.....	.....	.....	2,350	.....	.....	.....	23,000	.....	.....

NOTE.—Estimated from discharges at Edmonton.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Rocky Rapids, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		50,000a	6.89	28,675	5.88	21,360	3.14	6,950	1.98	4,570	4.41	2,320
2.....		45,000	6.93	28,975	5.38	18,170	3.27	7,345	1.83	4,345	4.45	2,320
3.....		44,500	6.73	27,475	5.23	17,195	3.35	7,625	1.72	4,220	4.68	2,320
4.....		41,500	6.88	28,670	5.10	16,350	3.33	7,555	1.69	4,190	4.75	2,275
5.....		40,700	7.03	29,725	5.18	16,870	3.31	7,485	1.67	4,170	4.90	2,195
6.....		40,400	6.33	24,510	5.13	16,545	3.16	7,000	1.66	4,160	5.09	2,180
7.....		41,300	5.93	21,745	5.10	16,350	3.10	6,825	1.65	4,150b	5.18	2,170
8.....		41,800	5.99	22,135	4.78	14,390	3.06	6,750	2.68	3,820c	5.20	2,100
9.....		39,000	5.98	22,070	4.68	13,840	3.03	6,675	3.78	3,525	5.18	1,990
10.....		38,600	5.80	20,900	4.48	12,740	2.73	5,960	2.27	3,150	5.22	1,560
11.....		38,000	5.57	19,405	4.23	11,450	2.63	5,760	2.48	3,085	5.22	1,805
12.....		34,000	5.51	19,015	4.00	10,300	2.60	5,700	4.12	3,070	5.18	1,800
13.....		35,500	5.46	18,690	3.73	9,020	2.52	5,540	4.03	3,030	5.16	1,800
14.....		38,000	5.39	18,235	3.58	8,430	2.49	5,480	4.55	3,000	5.17	1,800
15.....		94,200a	5.32	17,780	3.47	8,045	2.43	5,360	4.46	2,990	5.21	1,770
16.....	14.43	90,670b	5.47	18,755	3.50	8,150	2.37	5,240	4.50	2,960	5.37	1,730
17.....	11.84	67,740	5.41	18,365	3.58	8,430	2.31	5,120	4.54	2,900	5.45	1,700
18.....	11.93	68,505	5.39	18,235	3.50	8,150	2.28	5,060	4.77	2,500	5.60	1,660
19.....	11.03	61,040	7.53	33,475	3.60	8,500	2.30	5,100	4.70	2,755	5.74	1,660
20.....	10.13	53,840	6.93	28,975	3.53	8,355	2.33	5,160	4.78	2,720	5.62	1,640
21.....	9.58	49,440	8.68	42,240	3.58	8,430	2.35	5,200	4.72	2,715	5.50	1,560
22.....	8.93	44,240	8.08	37,600	3.50	8,150	2.30	5,100	4.77	2,700	5.67	1,520
23.....	8.58	41,440	7.09	30,175	3.33	7,555	2.25	5,000	4.64	2,680	5.63	1,500
24.....	8.33	39,475	6.68	27,100	3.33	7,555	2.23	4,960	4.76	2,575	5.72	1,450
25.....	7.54	33,550	6.59	26,425	3.43	7,905	2.15	4,825	4.74	2,480	5.80	1,470
26.....	7.23	31,225	6.36	24,720	3.28	7,380	2.10	4,750	4.85	2,410	5.88	1,460
27.....	6.98	29,350	6.13	23,145	3.18	7,030	2.10	4,750	4.76	2,350	5.90	1,450
28.....	6.58	26,350	5.99	22,135	3.13	6,925	2.10	4,750	4.62	2,315	5.95	1,440
29.....	6.38	24,860	5.68	20,120	3.08	6,800	2.10	4,750	4.65	2,310	5.95	1,430
30.....	6.98	29,350	5.63	19,795	3.08	6,800	2.10	4,750	4.50	2,315	5.90	1,420
31.....	6.78	27,850	5.93	21,745			2.07	4,705			5.94	1,410c

a to a Estimated from discharges at Edmonton.

b to b Estimated from gauge heights taken by W. H. Kew.

c to c Ice conditions.

## MONTHLY DISCHARGE of North Saskatchewan River at Rocky Rapids, for 1915.

(Drainage area 8,230 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,360	1,100	1,257	0.153	0.18	77,290
February.....	1,300	1,100	1,209	0.147	0.15	67,145
March.....	2,350	1,050	1,569	0.191	0.22	96,474
April.....	4,900	2,400	3,547	0.431	0.48	211,061
May.....	23,000	3,700	9,519	1.157	1.33	585,800
June.....	190,500	19,100	43,550	5.292	5.90	2,591,405
July.....	94,200	24,860	41,094	4.993	5.76	2,326,773
August.....	43,240	17,780	24,349	2.983	3.44	1,809,459
September.....	21,360	6,800	10,906	1.335	1.48	648,952
October.....	7,625	4,705	5,717	0.695	0.80	351,524
November.....	4,570	2,310	3,149	0.383	0.43	187,379
December.....	2,320	1,410	1,782	0.216	0.25	109,571
The year.....					20.42	8,962,332

## NORTH SASKATCHEWAN RIVER AT EDMONTON.

*Location.*—On river lot No. 17, NW.  $\frac{1}{4}$  Sec. 33, Tp. 52, Rge. 24, W. 4th Mer., at the low level traffic and railway bridge in the city of Edmonton.

*Records available.*—May 1, 1911, to December 31, 1915.

*Gauges.*—Two vertical staff gauges at this station, a low level gauge reading from 0 to 10 feet and a high level gauge reading from 10 to 34 feet. The high level gauge is spiked to a timber pier a short distance above the mill of the Edmonton Lumber Company, the low level gauge being attached to a pier about 75 feet above the other and 200 feet from the right bank of the river. Zero elevation of low level gauge maintained at 1,991.73 feet during 1911. Zero elevation of low level gauge maintained at 1,991.09 feet during 1912 and up to June 28, 1915. Zero elevation of high level gauge maintained at 1,995.67 feet during 1911–1912. Zero elevation of high level gauge maintained at 1,991.09 feet during 1913 and up to June 28, 1915. On June 28, 1915, both gauges were swept away by the flood and a temporary gauge was used until July 16 when a chain gauge was installed on the downstream side of the bridge between the third and fourth piers. The zero elevation of the chain gauge has since been maintained at 1,991.09 feet. On November 6 a staff gauge for winter use was fastened to the pier to which the old gauges were attached. This gauge is also at a zero elevation of 1,991.09 feet.

*Bench-mark.*—Permanent iron bench-mark on the right bank, close to the Edmonton Lumber Company's fence and 10 feet below the right hand abutment of the bridge. Elevation, 2,037.33 feet. (Department of Public Works of Canada datum.)

*Channel.*—One, slightly shifting at all stages.

*Discharge measurements.*—Made from a bridge.

*Floods.*—Up to 1915 the largest flood upon record took place in August, 1899, followed by another one, not quite so large in 1900. On both occasions considerable damage was done but no actual figures are available. On June 28, 1915, the water rose to a gauge height of 45.04 feet, which, as near as can be found, is some four feet higher than the high water mark of 1899. At a gauge height of about 35 feet the river overflowed the flats along the bank. Probably 2,000 people were rendered homeless and the loss to property is estimated at about \$750,000. The damage done to sidewalks, roads, and other city property is given at about \$17,500.00.

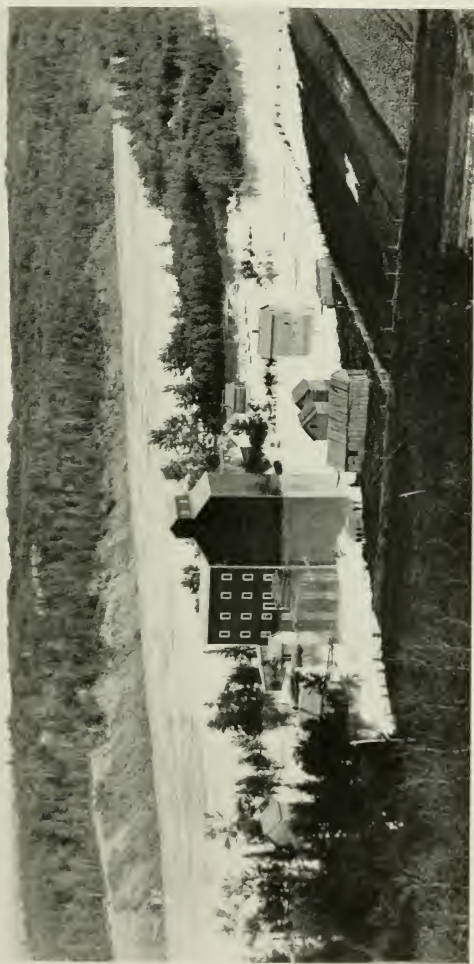
*Observer.*—Edmonton Lumber Company, per W. H. Schneider.

## DISCHARGE MEASUREMENTS of North Saskatchewan River at Edmonton, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-f.
Jan. 2	P. H. Daniells	330 <sup>a</sup>	2,061	0.61	7.98	1,255
Jan. 22 and 23	R. J. McGuinness	318 <sup>a</sup>	1,823	0.61	7.96	1,128
Feb. 14	do	318 <sup>a</sup>	1,803	0.62	8.10	1,090
Mar. 26	J. M. Paul	318 <sup>a</sup>	2,069	1.11	8.99	2,306
April 10	I. R. Strome	414	2,384	1.42	8.93	4,377
April 28	do	406	2,084	1.68	8.46	3,506
May 17	do	550	3,708	2.90	11.54	10,762
June 7	do	574	5,593	3.80	14.72	21,253
June 23	G. H. Whyte and I. R. Strome	577	5,882	3.66	14.93	21,651
June 27	I. R. Strome	612	11,127	6.03	24.20	67,133
June 28	do	649	20,870	7.78	39.50	162,583
June 30	do	631	12,993	5.97	26.72	77,538
July 16	do	631	14,407	6.28	28.96 <sup>b</sup>	90,469
July 28	do	594	7,374	3.86	17.12	28,445
Aug. 27	do	591	5,941	3.65	15.63	21,680
Sept. 17	do	543	3,526	2.24	11.08	7,901
Oct. 2	do	500	3,441	2.01	10.42	6,920
Oct. 20	do	484	2,935	1.75	9.70	5,145
Nov. 6	do	422	2,488	1.42	8.92	3,539
Nov. 29	J. M. Paul	375 <sup>a</sup>	2,564	0.87	9.07	2,232
Dec. 24	I. R. Strome	353 <sup>a</sup>	2,106	0.67	8.62	1,414

<sup>a</sup> Ice conditions.

<sup>b</sup> Chain gauge installed on bridge, and used until freeze-up.



North Saskatchewan River in flood at Edmonton, on August 19, 1899. General view looking west from road to low level traffic bridge.  
Copyright photograph published by permission from the owner, Ernest Brown, Limited, Edmonton, Alberta.





## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Edmonton, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	8.0	1,250 <sup>a</sup>	8.0	1,070	8.0	1,115	8.0	2,220	8.3	3,280	14.5	20,240
2.....	8.0	1,250	8.0	1,110	8.0	1,125	8.0	2,300	8.4	3,440	13.7	17,420
3.....	8.0	1,330	7.9	1,115	8.0	1,130	8.0	2,450	8.5	3,610	14.6	20,600
4.....	8.0	1,350	7.9	1,090	8.0	1,145	8.1	2,590	8.7	3,950	18.6	37,580
5.....	8.0	1,350	7.9	1,065	8.0	1,160	8.2	2,760	8.6	3,780	17.8	33,900
6.....	7.9	1,350	8.0	1,060	8.0	1,175	8.3	3,280	8.9	4,310	16.0	26,120
7.....	7.9	1,335	8.0	1,105	8.0	1,190	8.6	3,780 <sup>a</sup>	9.6	5,720	15.0	22,080
8.....	8.0	1,290	8.0	1,120	8.0	1,210	10.2	4,240 <sup>b</sup>	9.8	6,160	14.3	19,520
9.....	8.0	1,300	8.0	1,115	8.0	1,230	9.1	4,700 <sup>c</sup>	10.0	6,620	14.6	20,600
10.....	7.9	1,330	8.0	1,090	8.0	1,260	9.0	4,500	10.3	7,340	19.2	40,420
11.....	7.8	1,320	8.0	1,070	8.0	1,310	8.4	3,440	10.6	8,100	18.6	37,580
12.....	7.8	1,275	8.0	1,060	8.0	1,345	8.4	3,440	10.8	8,620	17.6	32,980
13.....	7.9	1,210	8.0	1,070	8.0	1,390	8.4	3,440	10.8	8,620	17.0	30,320
14.....	7.9	1,195	8.0	1,090	8.0	1,425	8.2	3,120	10.5	7,840	16.3	27,380
15.....	7.9	1,200	8.1	1,075	8.0	1,480	8.2	3,120	10.2	7,100	15.7	24,880
16.....	7.9	1,230	8.0	1,070	8.0	1,550	8.2	3,120	11.0	9,140	15.3	23,280
17.....	7.9	1,275	8.0	1,055	8.0	1,610	8.1	2,980	11.5	10,510	15.2	22,880
18.....	7.9	1,305	8.0	1,050	8.1	1,680	8.1	2,980	11.5	10,510	16.2	26,960
19.....	7.9	1,315	8.0	1,040	8.3	1,790	8.1	2,980	11.0	9,140	17.1	30,760
20.....	7.9	1,280	8.0	1,045	8.4	1,890	8.1	2,980	10.8	8,620	16.5	28,220
21.....	7.9	1,220	8.0	1,055	8.6	2,040	8.2	3,120	10.7	8,360	15.9	25,700
22.....	7.9	1,160	8.0	1,060	9.0	2,170	8.3	3,280	10.6	8,100	15.4	23,680
23.....	7.9	1,140	8.0	1,065	9.5	2,280	8.5	3,610	10.8	8,620	15.1	22,480
24.....	8.0	1,120	8.0	1,075	9.6	2,420	8.6	3,780	11.0	9,140	15.0	22,080
25.....	8.0	1,100	8.0	1,090	9.2	2,420	8.5	3,610	11.4	10,220	15.3	23,280
26.....	7.9	1,110	8.0	1,095	9.0	2,310	8.5	3,610	11.8	11,390	15.5	24,080
27.....	7.9	1,140	8.0	1,100	8.9	2,270	8.5	3,610	12.3	12,900	21.5	52,200
28.....	7.9	1,125	8.0	1,110	8.8	2,230	8.5	3,610	12.6	13,830	42.4	185,560
29.....	8.0	1,030	.....	.....	8.6	2,210	8.5	3,610	12.0	11,990	41.1	173,780
30.....	8.0	1,010	.....	.....	8.2	2,210	8.4	3,440	12.6	13,830	27.5	81,900
31.....	8.0	1,030	.....	.....	8.2	2,205	.....	.....	12.9	14,780	.....	.....

<sup>a</sup> Ice conditions Jan. 1 to April 7.<sup>b</sup> Ice jam; discharge interpolated on April 8.<sup>c</sup> Open water April 9 to Nov. 9.

Curve No. 1 April 9 to June 28; curve No. 2 June 29 to Nov. 9.

## DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Edmonton, for 1915.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	23.9	61,260	17.0	27,500	14.6	18,260	10.5	6,690	9.4	4,450	8.5	2,260
2.....	20.9	45,500	17.0	27,500	14.7	18,600	10.4	6,470	9.3	4,270	8.6	2,270
3.....	19.7	39,560	16.8	26,670	14.1	16,560	10.7	7,130	9.3	4,270	8.5	2,280
4.....	19.6	39,080	16.7	26,260	13.6	14,960	10.9	7,590	9.1	3,910	8.5	2,230
5.....	19.3	37,680	17.0	27,500	13.6	14,960	11.0	7,830	9.1	3,910	8.4	2,100
6.....	19.1	36,760	17.1	27,920	13.7	15,280	11.1	8,070	8.9	3,550	8.3	2,120
7.....	19.0	36,300	16.2	24,260	13.3	14,020	10.8	7,350	9.0	3,730	8.5	2,130
8.....	19.2	37,220	16.0	23,480	13.1	13,420	10.6	6,910	9.0	3,730	8.8	2,020
9.....	19.3	37,680	15.8	22,700	13.0	13,120	10.4	6,470	8.7	3,200 <sup>c</sup>	9.0	1,900
10.....	18.7	34,950	15.7	22,310	12.2	10,850	10.3	6,250	11.9	3,000 <sup>d</sup>	9.1	1,800
11.....	18.7	34,950	15.6	21,920	12.0	10,310	10.1	5,830	12.5	2,970	9.1	1,760
12.....	18.5	34,050	15.5	21,530	11.8	9,790	10.1	5,830	10.3	2,900 <sup>d</sup>	8.9	1,760
13.....	17.7	30,480	15.3	20,790	11.5	9,030	10.0	5,630	9.9	2,850 <sup>e</sup>	8.8	1,770
14.....	17.9	31,360	15.2	20,420	11.3	8,550	9.9	5,430	9.8	2,870	8.8	1,775
15.....	18.5	34,050	15.1	20,050	11.2	8,310	9.7	5,030	9.7	2,900	8.6	1,730
16.....	28.9	90,200	15.0	19,680	11.2	8,310	9.8	5,230	9.6	2,900	8.5	1,680
17.....	27.6	82,480	15.1	20,050	11.0	7,830	9.7	5,030	9.9	2,810	8.4	1,640
18.....	25.6	70,880	15.6	21,920	11.1	8,070	9.7	5,030	10.3	2,750	8.3	1,625
19.....	25.1	67,980	15.2	20,420	10.9	7,590	9.7	5,030	10.4	2,670	8.4	1,600
20.....	23.2	57,480	16.2	24,260	10.9	7,590	9.7	5,030	10.2	2,650	8.5	1,520
21.....	21.9	50,680	16.9	27,080	10.9	7,590	9.6	4,830	10.0	2,650	8.6	1,470
22.....	20.9	45,500	18.3	33,150	11.2	8,310	9.7	5,030	9.8	2,660	8.6	1,450
23.....	19.7	39,560	17.3	28,760	10.9	7,590	9.6	4,830	9.6	2,590	8.7	1,430
24.....	19.5	38,600	16.8	26,670	10.9	7,590	9.7	5,030	9.5	2,470	8.6	1,420
25.....	18.9	35,850	16.2	24,260	10.7	7,130	9.6	4,830	9.2	2,380	8.6	1,360
26.....	18.4	33,600	15.9	23,090	10.8	7,350	9.6	4,830	9.1	2,320	8.8	1,380
27.....	17.6	30,040	15.7	22,310	10.8	7,350	9.4	4,450	8.8	2,290	8.9	1,390
28.....	17.2	28,340	15.4	21,160	10.6	6,910	9.4	4,450	9.1	2,270	8.9	1,340
29.....	16.8	26,670	15.0	19,680	10.6	6,910	9.4	4,450	8.9	2,230	9.0	1,340
30.....	16.8	26,670	14.6	18,260	10.5	6,690	9.6	4,830	8.7	2,230	9.1	1,330
31.....	16.9	27,080	14.7	18,600	.....	.....	9.4	4,450	.....	.....	9.0	1,320 <sup>e</sup>

<sup>c</sup> Open water April 9 to Nov. 9.

Curve No. 1 April 9 to June 28; curve No. 2 June 29 to Nov. 9.

<sup>d</sup> River freezing Nov. 10 to 12; discharge interpolated.

<sup>e</sup> Ice conditions Nov. 13 to Dec. 31.

## MONTHLY DISCHARGE of North Saskatchewan River at Edmonton, for 1915.

(Drainage area 10,620 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,350	1,010	1,223	0.115	0.13	75,196
February.....	1,120	1,040	1,079	0.102	0.11	59,924
March.....	2,420	1,115	1,677	0.158	0.18	103,114
April.....	4,700	2,220	3,323	0.313	0.35	197,730
May.....	14,780	3,280	8,373	0.788	0.91-	514,836
June.....	185,560	17,420	39,272	3.700	4.13	2,336,848
July.....	90,200	26,670	42,661	4.020	4.64	2,623,121
August.....	33,150	18,260	23,554	2.220	2.56	1,448,294
September.....	18,600	6,690	10,294	0.969	1.08	612,540
October.....	8,070	4,450	5,673	0.534	0.62	348,816
November.....	4,450	2,230	3,013	0.284	0.32	179,287
December.....	2,280	1,320	1,716	0.162	0.19	105,512
The year.....					15.22	8,605,218

# MONTHLY DISCHARGE of North Saskatchewan River at Edmonton, for 1914.

(Drainage area 10,620 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,450	968	1,213	0.114	0.13	74,583
February.....	1,100	800	952	0.090	0.09	52,871
March.....	1,300	975	1,134	0.107	0.12	69,728
April.....	6,570	1,075	2,983	0.281	0.31	177,501
May.....	15,000	3,950	9,064	0.854	0.98	537,324
June.....	61,740	5,440	24,618	2.320	2.59	1,464,880
July.....	25,620	11,130	18,889	1.780	2.05	1,161,429
August.....	14,400	9,110	11,099	1.040	1.20	682,439
September.....	9,370	4,240	6,492	0.611	0.68	386,300
October.....	5,840	3,130	4,558	0.429	0.49	280,258
November.....	2,970	2,050	2,473	0.233	0.26	147,157
December.....	2,350	700	1,102	0.104	0.12	67,762
The year.....					9.02	5,122,232

NOTE.—This table is inserted in this report to correct a table which was published on page 76 of the report for 1914. The records for the month of April and the totals were incorrect as then published.



## SESSIONAL PAPER No. 25c

## STURGEON RIVER NEAR McDONALD'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 13, Tp. 54, Rge. 5, W. 5th Mer., at traffic bridge near McDonald's ranch and 100 feet below Canadian Northern Railway trestle over Sturgeon River.

*Records available.*—April 21, 1914, to November 1, 1914, and March 4, 1915, to October 31, 1915.

*Gauge.*—Vertical staff on right bank of river, spiked to pile on upstream side of bridge. Datum maintained at 90.32 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on left bank of stream 50 feet upstream from gauge. Assumed elevation, 100.00 feet.

*Channel.*—One channel at all stages, shifting.

*Discharge measurements.*—Made from a bridge.

*Winter flow.*—Gauge height observations discontinued on November 1. One discharge measurement made under winter conditions.

*Observer.*—H. H. Jones.

*Remarks.*—Relation between gauge height and discharge changed during summer because of a growth of weeds in the river.

## DISCHARGE MEASUREMENTS of Sturgeon River near McDonald's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 4.....	R. J. McGuinness.....	27	9.05	0.04	3.01	0.37
April 1.....	J. M. Paul.....	30	36.50	0.80	2.91	29.00
April 19.....	do.....	27	34.90	0.82	2.78	28.00
May 10.....	do.....	25	32.80	0.60	2.68	19.70
May 29.....	do.....	26	32.40	0.81	2.64	26.00
June 15.....	do.....	53	136.20	1.46	4.63	199.00
July 7.....	do.....	53	113.60	0.75	4.13	85.00
July 26.....	do.....	53	148.70	0.56	4.71	83.00
Aug. 11.....	P. M. Sauder and J. M. Paul...	53	131.20	0.37	4.53	49.00
Aug. 30.....	J. M. Paul.....	53	122.00	0.30	4.33	36.00
Sept. 15.....	T. H. Burt.....	53	110.00	0.42	3.96	46.00
Oct. 1.....	J. M. Paul.....	53	91.00	0.39	3.66	35.00
Oct. 20.....	do.....	53	72.60	0.56	3.33	41.00

DAILY GAUGE HEIGHT AND DISCHARGE OF Sturgeon River near McDonald's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.85	28	2.75	26	2.85	28
2.....			2.85	28	2.73	25	2.98	31
3.....			2.89	29	2.71	25	3.40	43
4.....			2.89	29	2.70	24	4.00	74
5.....			2.89	29	2.69	24	4.02	76
6.....			2.89	29	2.68	24	3.85	64
7.....			2.89	29	2.68	24	4.20	92
8.....			2.89	29	2.68	24	4.65	205
9.....			2.87	28	2.67	24	4.75	241
10.....			2.87	28	2.66	24	4.80	259
11.....			2.85	28	2.65	23	4.85	277
12.....			2.85	28	2.64	23	4.82	266
13.....			2.84	27	2.60	22	4.75	241
14.....			2.84	27	2.57	22	4.70	223
15.....			2.83	27	2.55	21	4.70	223
16.....			2.83	27	2.54	21	4.68	216
17.....			2.83	27	2.54	21	4.68	216
18.....	3.41	44	2.83	27	2.53	21	4.67	212
19.....	3.42	44	2.79	26	2.52	21	4.62	194
20.....	3.43	44	2.78	26	2.50	20	4.56	173
21.....	3.44	45	2.79	26	2.50	20	4.50	151
22.....	3.50	47	2.78	26	2.50	20	4.49	148
23.....	3.51	48	2.78	26	2.49	20	4.47	143
24.....	3.37	42	2.78	26	2.48	20	4.45	138
25.....	3.38	43	2.77	26	2.49	20	4.40	124
26.....	3.29	40	2.77	26	2.50	20	4.40	124
27.....	3.30	40	2.77	26	2.50	20	4.38	120
28.....	3.31	40	2.76	26	2.55	21	4.37	119
29.....	3.33	41	2.76	26	2.55	21	4.35	115
30.....	3.25	38	2.75	26	2.58	22	4.35	115
31.....	3.26	38	.....	.....	2.80	27	.....	.....



North Saskatchewan River in flood at Edmonton, on June 28, 1915. General view looking west from road to low level traffic bridge. Note the same building (grist mill) as in the full-page view. Water was about three feet below maximum when this photograph was taken. Taken by I. R. Strome.



North Saskatchewan River in flood at Edmonton, on June 28, 1915. Note the loaded cars on the bridge to weigh it down. Water was about one foot below maximum when this photograph was taken. Taken by I. R. Strome.





## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River near McDonald's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.30	106	4.63	70	4.35	40	3.70	36
2.....	4.25	99	4.63	68	4.30	39	3.70	37
3.....	4.20	92	4.62	66	4.24	39	3.70	38
4.....	4.15	87	4.62	65	4.20	39	3.68	38
5.....	4.10	82	4.61	63	4.20	40	3.65	38
6.....	4.10	82	4.61	61	4.20	42	3.65	39
7.....	4.10	82	4.60	59	4.18	43	3.63	39
8.....	4.10	79	4.60	58	4.16	44	3.60	39
9.....	4.10	76	4.60	56	4.15	45	3.57	39
10.....	4.10	74	4.59	56	4.12	45	3.55	40
11.....	4.15	76	4.59	52	4.10	46	3.55	40
12.....	4.15	73	4.58	51	4.05	46	3.48	39
13.....	4.20	75	4.57	50	4.02	46	3.45	39
14.....	4.42	92	4.55	49	4.00	46	3.40	38
15.....	4.55	106	4.55	49	4.00	48	3.38	38
16.....	4.56	102	4.55	48	4.00	48	3.35	38
17.....	4.57	99	4.55	48	4.00	48	3.35	39
18.....	4.57	95	4.53	47	4.00	48	3.35	40
19.....	4.59	94	4.50	46	4.00	48	3.35	40
20.....	4.60	92	4.48	44	4.00	48	3.33	41
21.....	4.65	94	4.47	44	4.00	48	3.30	40
22.....	4.68	94	4.45	43	4.00	48	3.29	40
23.....	4.70	92	4.45	42	4.00	48	3.28	39
24.....	4.70	88	4.45	42	4.00	47	3.25	38
25.....	4.70	86	4.45	42	3.95	45	3.24	38
26.....	4.70	82	4.45	41	3.95	45	3.20	37
27.....	4.70	81	4.45	41	3.90	43	3.20	37
28.....	4.69	80	4.44	40	3.89	43	3.20	37
29.....	4.65	75	4.44	40	3.86	42	3.20	37
30.....	4.65	74	4.42	39	3.80	40	3.20	37
31.....	4.63	71	4.40	40	.....	.....	3.20	37

Shifting conditions July 8 to Oct. 19.

## MONTHLY DISCHARGE of Sturgeon River near McDonald's Ranch, for 1915.

(Drainage area 100 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (18-31).....	48	38	42	0.42	0.22	1,166
April.....	29	26	27	0.27	0.30	1,607
May.....	27	20	22	0.22	0.25	1,353
June.....	277	28	153	1.53	1.73	9,223
July.....	106	71	86	0.86	0.99	5,288
August.....	70	39	50	0.50	0.58	3,074
September.....	48	39	44	0.44	0.49	2,618
October.....	41	36	38	0.38	0.44	2,337
The period.....					5.00	26,666

## STURGEON RIVER NEAR ONOWAY.

*Location.*—On the SE.  $\frac{1}{4}$  of Sec. 7, Tp. 55, Rge. 2, W. 5th Mer., at a highway bridge about 3 miles northwest of Onoway near Trek's ranch.

*Records available.*—April 23, 1914, to November 1, 1914, and March 3, 1915, to October 31, 1915.

*Gauge.*—Vertical staff, spiked to pile near centre of downstream side of bridge. Datum maintained at 95.16 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on downstream side of east abutment. Assumed elevation, 100.00 feet.

*Channel.*—One channel at all stages, permanent.

*Discharge measurements.*—Made from a bridge.

*Winter flow.*—Gauge height observations discontinued on November 1. Stream affected by ice from November to April.

*Observer.*—J. Calnan.

*Remarks.*—Relation of gauge height to discharge changed during summer because of a growth of weeds in the river.

#### DISCHARGE MEASUREMENTS of Sturgeon River near Onoway, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 3.....	R. J. McGuinness.....	38	59	0.76	3.35	45
Mar. 31.....	J. M. Paul.....	38	71	1.05	1.96	74
April 17.....	do.....	36	73	1.33	2.27	97
May 13.....	do.....	35	62	0.98	2.09	61
June 1.....	do.....	35	64	1.01	2.13	65
June 17.....	do.....	37	93	1.20	2.86	113
July 9.....	do.....	37	95	0.59	2.83	56
July 28.....	do.....	37	98	0.60	3.04	59
Aug. 13.....	do.....	37	112	0.47	3.20	52
Aug. 27.....	do.....	37	117	0.51	3.44	60
Sept. 16.....	T. H. Burt.....	35	111	0.70	3.30	77
Oct. 2.....	J. M. Paul.....	37	104	0.89	3.14	92
Oct. 21.....	do.....	34	97	1.10	3.02	107

#### DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River near Onoway, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.02	78	2.30	86	2.10	63
2.....			2.04	80	2.30	85	2.10	63
3.....			2.06	81	2.30	84	2.50	87
4.....			2.18	90	2.30	83	3.00	124
5.....			2.20	91	2.30	81	2.70	101
6.....			2.21	92	2.30	80	2.60	94
7.....			2.22	93	2.30	79	2.50	87
8.....			2.23	94	2.30	78	2.40	80
9.....			2.24	95	2.30	76	4.00	204
10.....			2.25	96	2.30	75	4.40	236
11.....	3.00	163	2.26	96	2.30	74	3.50	164
12.....	3.00	163	2.27	97	2.30	74 <sup>a</sup>	3.20	140
13.....	3.00	163	2.28	98	2.20	68	3.10	132
14.....	3.00	163	2.30	100	2.20	68	3.00	124
15.....	3.00	163	2.32	102	2.20	68	2.80	108
16.....	3.00	163	2.34	104	2.20	68	2.80	108
17.....	3.00	163	2.30	100	2.10	63	2.80	108
18.....	3.00	163	2.30	99 <sup>a</sup>	2.10	63	2.80	106 <sup>b</sup>
19.....	3.00	163	2.30	98	2.10	63	2.80	104
20.....	2.70	136	2.30	98	2.10	63	2.80	102
21.....	2.20	91	2.30	96	2.10	63	2.80	99
22.....	2.10	84	2.30	96	2.10	63	2.80	97
23.....	2.10	84	2.30	95	2.10	63	2.80	94
24.....	2.10	84	2.30	94	2.10	63	2.80	92
25.....	2.10	84	2.30	93	2.10	63	2.80	89
26.....	2.10	84	2.30	92	2.10	63	2.80	87
27.....	2.10	84	2.00	70	2.10	63	3.00	98
28.....	2.10	84	2.30	90	2.10	63	2.80	82
29.....	2.10	84	2.30	88	2.10	63	2.80	79
30.....	2.10	84	2.30	87	2.10	63	3.10	98
31.....	2.00	77			2.10	63		

<sup>a</sup> Shifting conditions April 18 to May 12.

<sup>b</sup> Shifting conditions June 18 to Oct. 31.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River near Onoway, for 1915—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.00	88	3.00	54	3.40	63	3.10	88
2.....	3.00	85	3.00	53	3.40	64	3.10	89
3.....	3.00	82	3.10	56	3.40	66	3.10	90
4.....	3.00	80	3.10	56	3.40	67	3.10	92
5.....	2.80	65	3.10	55	3.30	63	3.10	93
6.....	2.80	62	3.10	54	3.30	64	3.10	94
7.....	2.80	60	3.10	53	3.30	66	3.10	95
8.....	2.80	57	3.10	52	3.40	73	3.20	104
9.....	2.80	55	3.10	51	3.30	69	3.20	105
10.....	2.80	54	3.10	50	3.30	70	3.20	106
11.....	3.00	63	3.10	50	3.30	72	3.20	108
12.....	3.10	69	3.20	52	3.30	73	3.10	102
13.....	3.00	62	3.20	52	3.30	74	3.10	103
14.....	3.10	68	3.20	52	3.20	69	3.10	104
15.....	3.10	68	3.20	52	3.20	70	3.10	105
16.....	3.10	67	3.20	52	3.20	71	3.10	106
17.....	3.10	67	3.20	51	3.30	78	3.10	108
18.....	3.00	61	3.20	51	3.30	80	3.10	109
19.....	3.00	60	3.40	60	3.30	82	3.10	110
20.....	3.10	65	3.40	60	3.30	84	3.10	112
21.....	3.10	65	3.40	60	3.30	85	3.00	106
22.....	3.10	64	3.40	60	3.30	87	3.00	106
23.....	3.10	64	3.40	59	3.20	82	3.00	106
24.....	3.10	64	3.40	59	3.20	83	3.00	106
25.....	3.10	64	3.40	59	3.20	85	3.00	106
26.....	3.10	63	3.40	58	3.20	86	3.00	106
27.....	3.10	63	3.40	58	3.20	88	3.00	106
28.....	3.00	57	3.30	54	3.10	83	3.00	106
29.....	3.00	56	3.40	60	3.10	84	3.00	106
30.....	3.00	56	3.40	61	3.10	86	3.10	110
31.....	3.00	55	3.40	62	.....	.....	3.00	106b

b Shifting conditions June 18 to Oct. 31.

## MONTHLY DISCHARGE of Sturgeon River near Onoway, for 1915.

(Drainage area 241 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (11-31) .....	163	77	120	0 498	0 39	4,998
April.....	104	70	93	0 386	0 43	5,534
May.....	86	63	79	0 290	0 33	4,304
June.....	236	63	108	0 448	0 50	6,426
July.....	88	54	65	0 270	0 31	3,997
August.....	62	50	55	0 228	0 26	3,382
September.....	88	63	76	0 315	0 35	4,523
October.....	112	88	103	0 427	0 49	6,333
The period.....					3 06	39,496

## STURGEON RIVER NEAR VILLENEUVE.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 31, Tp. 54, Rge. 26, W. 4th Mer., at the highway bridge near Mageau's ranch, and about two and one-half miles north of Villeneuve and about three miles west of Ray.

*Records available.*—April 22, 1914, to October 31, 1914, and March 2, 1915, to October 30, 1915.

*Gauge.*—Vertical staff, spiked to upstream end of the pier near the right bank. Elevation of zero of gauge 88.97 feet.

*Bench-mark.*—Permanent iron bench-mark on left bank of river and 30 feet upstream from bridge. Assumed elevation, 100.00 feet.

*Channels.*—Straight for about 25 feet on either side of section. Gravel bed covered with clay and sand, fairly permanent. Two channels at high stages, one channel at low stages.

*Discharge measurements.*—Made from a bridge.

*Winter flow.*—Gauge height observations discontinued on November 1. Stream affected by ice from November to April.

*Observer.*—V. Mageau.

### DISCHARGE MEASUREMENTS of Sturgeon River near Villeneuve, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 2	R. J. McGuinness	50.0	135.5	0.53	4.62	72
Mar. 30	J. M. Paul	54.0	263.0	1.01	5.78	266
April 16	do	46.5	230.0	0.81	4.03	187
May 12	do	44.5	182.5	0.35	3.16	64
May 31	do	44.5	176.2	0.51	2.94	90
June 12	do	70.5	668.0	2.76	11.05	1,839
June 16	do	73.0	573.7	1.87	9.35	1,072
July 8	do	54.0	241.4	0.92	4.31	223
July 27	do	53.5	221.8	0.87	4.11	194
Aug. 12	do	47.5	167.8	0.58	3.24	97
Aug. 28	do	47.5	160.4	0.50	3.12	80
Sept. 17	T. H. Burt	47.5	174.0	0.58	3.31	100
Oct. 3	J. M. Paul	48.5	175.6	0.62	3.42	109
Oct. 22	do	49.5	183.9	0.68	3.55	126

### DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River near Villeneuve, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			3.50	128	3.00	82
2			3.45	123	3.20	99
3			3.45	123	5.20	337
4			3.45	123	6.30	491
5			3.45	123	7.00	598
6			3.40	118	7.25	638
7			3.35	113	7.30	646
8	5.90	432	3.32	110	7.10	614
9	5.70	404	3.30	108	7.62	702
10	5.10	324	3.25	104	8.80	937
11	4.70	272	3.20	99	10.76	1,661
12	4.50	246	3.20	99	10.92	1,756
13	4.30	220	3.15	99	10.97	1,787
14	4.20	207	3.10	90	10.72	1,638
15	4.10	194	3.00	82	10.22	1,378
16	4.05	188	2.95	78	9.60	1,145
17	4.00	182	2.95	78	8.95	972
18	3.85	164	2.90	74	8.35	838
19	3.75	154	2.85	70	7.70	716
20	3.65	143	2.80	67	7.00	598
21	3.60	138	2.75	64	6.45	514
22	3.65	143	2.70	60	6.05	453
23	3.75	154	2.70	60	5.75	411
24	3.78	157	2.70	60	5.50	376
25	3.73	151	2.75	64	5.25	344
26	3.70	148	2.80	67	5.10	324
27	3.60	138	2.85	70	6.70	551
28	3.60	138	2.85	70	7.00	598
29	3.55	133	2.85	70	6.70	551
30	3.50	128	2.90	74	6.50	521
31			2.90	74		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River near Villeneuve, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	6.35	498	3.65	143	3.12	92	3.32	110
2.....	6.10	461	3.60	138	3.10	90	3.32	110
3.....	5.70	404	3.55	133	3.10	90	3.40	118
4.....	5.05	318	3.50	128	3.10	90	3.42	120
5.....	5.00	311	3.45	123	3.10	90	3.45	123
6.....	4.70	272	3.40	118	3.11	91	3.48	126
7.....	4.45	240	3.40	118	3.15	94	3.48	126
8.....	4.35	226	3.35	113	3.15	94	3.48	126
9.....	4.25	214	3.30	108	3.15	94	3.48	126
10.....	4.25	214	3.30	108	3.17	96	3.48	126
11.....	4.40	233	3.25	104	3.15	94	3.50	128
12.....	4.35	226	3.25	104	3.15	94	3.50	128
13.....	4.40	233	3.20	99	3.17	96	3.50	128
14.....	4.55	252	3.15	94	3.18	97	3.49	127
15.....	4.60	259	3.10	90	3.20	99	3.51	129
16.....	4.80	285	3.10	90	3.28	106	3.51	129
17.....	4.90	298	3.05	86	3.30	108	3.51	129
18.....	5.00	311	3.05	86	3.31	109	3.52	130
19.....	5.00	311	3.10	90	3.31	109	3.53	131
20.....	4.90	298	3.10	90	3.31	109	3.54	132
21.....	4.80	285	3.08	88	3.32	110	3.54	132
22.....	4.65	266	3.06	87	3.32	110	3.54	132
23.....	4.50	246	3.05	86	3.32	110	3.54	132
24.....	4.35	226	3.03	84	3.32	110	3.50	128
25.....	4.25	214	3.02	84	3.32	110	3.50	128
26.....	4.20	207	3.02	84	3.32	110	3.40	118
27.....	4.15	200	3.08	88	3.31	109	3.40	118
28.....	4.03 <sub>a</sub>	186	3.09	89	3.31	109	3.40	118
29.....	3.90	170	3.12	92	3.31	109	3.40	118
30.....	3.85	164	3.12	92	3.32 <sub>a</sub>	110	3.40 <sub>a</sub>	118
31.....	3.70	148	3.12	92			3.40	118

<sup>a</sup> Gauge heights interpolated.

## MONTHLY DISCHARGE of Sturgeon River near Villeneuve, for 1915.

(Drainage area 506 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (8 to 30).....	432	128	198	0.391	0.33	9,031
May.....	128	60	88	0.174	0.20	5,411
June.....	1,787	82	743	1.468	1.64	44,312
July.....	148	148	264	0.522	0.60	16,233
August.....	143	84	101	0.200	0.23	6,210
September.....	110	90	101	0.200	0.22	6,010
October.....	132	110	125	0.247	0.28	7,686
The period.....					3.50	94,793

## STURGEON RIVER AT ST. ALBERT.

*Location.*—Between river lots 27 and 52 in St. Albert settlement, Alberta, at the highway bridge crossing the Sturgeon river in the village of St. Albert.

*Records available.*—April 23, 1913, to October 31, 1915.

*Gauge.*—Vertical staff fastened to sheet piling on the left bank of the river near the upstream face of the left abutment. Zero elevation maintained at 90.23 feet since establishment.

*Bench-mark.*—On the cement sill of the east basement window of the St. Albert hotel and marked "B.M., D. 1" and "broad arrow," in white paint. Assumed elevation, 100.00 feet.

*Channel*.—One channel at all stages, fairly permanent.

*Control*.—Vegetation in bed of stream causes a change of control during the summer.

*Discharge measurements*.—Made from a bridge.

*Winter flow*.—Stream affected by ice from November to April. Previously winter measurements have been taken but were discontinued during winter.

*Observer*.—Lawrence Farrel.

### DISCHARGE MEASUREMENTS of Sturgeon River at St. Albert, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 8	P. H. Daniells	90	74	0.83	2.16	62
Jan. 29	R. J. McGuinness	90	77	0.80	2.47	62
Feb. 22	do	90	60	0.92	2.82	55
Mar. 25	J. M. Paul	85	374	0.82	4.28	308
April 8	I. R. Strome	85	365	1.37	4.13	501
April 13	J. M. Paul	85	366	1.25	3.66	458
April 26	I. R. Strome	85	237	0.99	2.51	234
May 14	do	75	155	0.68	1.71	106
June 4	do	84	210	0.84	2.20	176
June 21	G. H. Whyte and I. R. Strome	85	604	1.45	6.82	879
July 26	I. R. Strome	82	337	1.32	3.66	438
Aug. 19	do	82	178	0.82	1.85	146
Sept. 10	do	75	156	0.65	1.53	101
Sept. 29	do	79	162	0.71	1.66	116
Oct. 18	do	82	170	0.75	1.78	128
Nov. 4	do	82	174	0.74	1.83	132

### DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River at St. Albert, for 1915.

DAY.	January.		February.		March.		April.		May.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2.07	60a	2.53	61	2.90	57	4.10	520	2.27	192
2	2.08	59	2.51	61	2.92	57	4.00	500	2.29	195
3	2.08	58	2.48	61	2.93	58	3.95	490	2.25	189
4	2.10	58	2.50	62	2.95	58	3.90	480	2.19	181
5	2.12	59	2.51	62	2.96	59	3.85	470	2.18	179
6	2.12	60	2.54	60	2.96	59	3.87	474	2.13	172
7	2.12	61	2.54	59	2.97	59	3.91	482	2.20	182
8	2.16	62	2.59	57	2.99	60	3.96	492	2.04	161
9	2.17	63	2.62	56	3.00	60	3.97	494	2.03	160
10	2.19	64	2.62	57	3.01	61	3.94	488	2.04	161
11	2.21	64	2.63	58	3.01	61	3.84	468	1.98	154
12	2.21	64	2.66	59	3.03	62	3.77	454	1.88	142
13	2.22	63	2.69	59	3.05	62	3.67	434	1.92	146
14	2.23	60	2.69	60	3.07	63	3.60	420	1.73	124
15	2.25	58	2.70	60	3.08	64	3.45	390	1.66	116
16	2.27	60	2.74	59	3.10	65	3.35	371	1.72	122
17	2.28	63	2.76	58	3.12	66	3.25	353	1.67	117
18	2.29	66	2.76	56	3.22	67	3.15	335	1.62	112
19	2.33	66	2.78	56	3.27	67	3.01	310	1.62	112
20	2.35	65	2.81	56	3.32	68	2.80	274	1.60	110
21	2.36	64	2.81	55	3.41	69	2.77	269	1.57	107
22	2.39	63	2.82	55	3.46	70a	2.76	267	1.52	102
23	2.41	62	2.87	57	3.86	135b	2.70	257	1.45	95
24	2.43	64	2.88	58	4.01	200	2.60	240	1.34	85
25	2.45	63	2.89	56	4.29	265	2.50	225	1.32	84
26	2.47	62	2.89	55	4.44	330	2.39	209	1.44	94
27	2.47	60	2.90	56	4.50	395	2.54	231	1.41	91
28	2.47	61	2.90	56	4.48	460	2.54	231	1.38	88
29	2.49	62			4.47	525b	2.42	213	1.37	88
30	2.52	62			4.40	550	2.38	207	1.49	99
31	2.54	60			4.25	550			1.42	92

a to a ice conditions.

b to b ice breakup; discharge interpolated.

c Shifting conditions June 13 to July 10.



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River at St. Albert, for 1915.—*Concluded.*

DAY.	June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	1.44	94	6.12	836	2.97	303	1.56	106	1.67	117
2	1.60	110	6.03	825	2.87	286	1.55	105	1.68	118
3	1.85	138	5.98	828	2.77	269	1.54	104	1.70	120
4	2.10	168	5.87	814	2.67	252	1.52	102	1.72	122
5	2.53	229	5.76	800	2.57	235	1.50	100	1.75	126
6	2.88	288	5.59	776	2.47	220	1.53	103	1.75	126
7	3.18	340	5.42	750	2.37	205	1.53	103	1.75	126
8	3.46	392	5.30	736	2.52	228	1.53	103	1.74	125
9	3.81	462	5.17	720	2.32	199	1.53	103	1.73	124
10	4.19	538	5.04	702 <sup>c</sup>	2.27	192	1.53	103	1.75	126
11	4.51	602	4.91	682	2.22	185	1.53	103	1.75	126
12	5.01	702	4.84	668	2.12	171	1.52	102	1.77	128
13	5.54	792 <sup>c</sup>	4.61	622	2.07	164	1.51	101	1.77	128
14	5.97	858	4.47	594	2.02	158	1.49	99	1.76	127
15	6.28	900	4.42	584	1.97	152	1.54	104	1.75	126
16	6.57	940	4.34	568	1.92	146	1.56	106	1.78	130
17	6.76	958	4.27	554	1.86	139	1.58	108	1.77	128
18	6.88	960	4.24	548	1.87	140	1.60	110	1.78	130
19	6.90	940	4.19	538	1.83	136	1.61	111	1.81	133
20	6.89	916	4.12	524	1.80	132	1.62	112	1.80	132
21	6.82	879	4.05	510	1.77	128	1.61	111	1.79	131
22	6.75	875	4.00	500	1.73	124	1.62	112	1.81	133
23	6.62	858	3.92	484	1.70	120	1.61	111	1.82	134
24	6.49	840	3.82	464	1.65	115	1.61	111	1.83	136
25	6.35	820	3.72	444	1.62	112	1.63	113	1.85	138
26	6.12	784	3.67	434	1.61	111	1.61	111	1.85	138
27	6.04	780	3.54	408	1.63	113	1.62	112	1.85	138
28	6.17	814	3.44	388	1.60	110	1.66	116	1.86	139
29	6.17	824	3.32	366	1.59	109	1.68	118	1.88	142
30	6.17	836	3.22	348	1.58	108	1.66	116	1.85	138
31			3.12	330	1.57	107			1.90	144

<sup>c</sup> Shifting conditions June 13 to July 10.

## MONTHLY DISCHARGE of Sturgeon River at St. Albert, for 1915.

(Drainage area 1,010 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	66	58	62	0.061	0.07	3,812
February	62	55	58	0.057	0.06	3,221
March	580	57	155	0.153	0.18	9,531
April	520	207	368	0.364	0.41	21,898
May	195	84	131	0.130	0.15	8,055
June	960	94	655	0.648	0.72	38,975
July	836	330	592	0.586	0.68	36,401
August	303	107	167	0.165	0.19	10,268
September	118	99	107	0.106	0.12	6,367
October	144	117	130	0.129	0.15	7,993
The period					2.73	146,531

## STURGEON RIVER NEAR FORT SASKATCHEWAN.

*Location.*—On the NW  $\frac{1}{4}$  Sec. 28, Tp. 55, Rge. 22, W. 4th Mer., at the steel traffic bridge about five miles north of Fort Saskatchewan and one and one-half miles from the mouth of the river.

*Records available.*—January 1, 1914, to December 31, 1915. Discharge measurements only in 1913.

*Gauge.*—Vertical staff fastened to a pile on the left bank of the river. Chain gauge installed on August 20, 1915, on the centre of the bridge downstream side. Zero elevation of both gauges maintained at 87.52 feet since establishment.

*Bench-marks.*—Marked with white paint on top of the downstream side of the left abutment. Assumed elevation, 100.00 feet. Auxiliary bench-mark on downstream side of left wing wall marked "B.M., D.I.," and "broad arrow," in white paint. Elevation, 96.00 feet; referred to assumed bench-mark.

*Channel.*—One permanent channel at all stages.

*Discharge measurements.*—Made from a bridge.

*Winter flow.*—Stream affected by ice from November to April.

*Observer.*—A. McDougall.

### DISCHARGE MEASUREMENTS of Sturgeon River near Fort Saskatchewan, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 5	P. H. Daniells	49	85	0.68	3.60	57
Jan. 26	R. J. McGuinness	45	83	0.67	3.76	56
Feb. 23	do	45	72	0.76	4.17	55
Mar. 27	J. M. Paul	79	50	1.08	4.42	54
Apr. 9	I. R. Strome	79	237	2.62	4.24	623
Apr. 27	do	69	173	1.69	3.52	294
May 15	do	64	143	1.04	3.14	148
June 5	do	66	158	1.23	3.30	195
June 22	G. H. Whyte and I. R. Strome	78	321	3.16	5.20	1,015
July 27	I. R. Strome	76	230	2.18	4.10	501
Aug. 20	do	68	157	1.12	3.30	175
Sept. 11	do	68	144	0.86	3.13	124
Oct. 1	do	68	144	0.88	3.17	127
Oct. 19	do	68	145	0.94	3.22	137
Nov. 8	J. M. Paul	73	173	1.27	3.31	222
Nov. 30	do	66	134	0.85	3.94	114
Dec. 27	C. M. O'Neil	36	94	0.76	4.77	71

### DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River near Fort Saskatchewan, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	3.60	57 <sup>a</sup>	4.01	58	4.22	56	5.13	600	3.40	240	3.00	108
2	3.60	55	4.01	59	4.22	56	4.93	743 <sup>b</sup>	3.40	240	3.00	108
3	3.60	56	4.01	59	4.12	55	4.73	873	3.40	240	3.10	136
4	3.60	57	4.01	59	4.12	55	4.73	873	3.40	240	3.20	166
5	3.60	58	4.01	60	4.12	56	4.63	823	3.30	200	3.30	200
6	3.60	59	4.12	60	4.12	57	4.53	773	3.30	200	3.40	240
7	3.60	60	4.12	61	4.12	57	4.53	773	3.30	200	3.50	280
8	3.60	61	4.02	61	4.12	58	4.53	773	3.30	200	3.65	344
9	3.60	61	4.02	59	4.12	59	4.26	638	3.30	200	3.85	436
10	3.60	61	4.02	58	4.12	59	4.26	638	3.20	166	4.05	533
11	3.70	61	4.02	58	4.11	60	4.26	638	3.20	166	4.15	583
12	3.70	60	3.92	58	4.11	60	4.16	588	3.20	166	4.20	608
13	3.70	58	3.92	59	4.11	61	4.16	588	3.20	166	4.35	683
14	3.70	56	3.92	59	4.01	62	4.06	538	3.20	166	4.50	758
15	3.70	57	3.92	60	4.21	62	4.06	538	3.10	136	4.65	833
16	3.70	59	3.93	60	4.31	64	3.96	489	3.10	136	4.85	933
17	3.70	60	3.93	59	4.51	66	3.96	489	3.10	136	4.90	958
18	3.70	59	3.93	59	4.11	68	3.86	441	3.10	136	5.00	1,010
19	3.60	58	3.93	58	4.01	70	3.86	441	3.10	136	5.05	1,030 <sup>c</sup>
20	3.60	57	3.93	58	4.01	72	3.86	441	3.10	136	5.10	1,050
21	3.60	57	3.93	57	4.30	74	3.76	394	3.10	136	5.10	1,040
22	3.60	56	4.13	56	4.70	76	3.76	394	3.10	136	5.15	1,055
23	3.70	56	4.13	55	4.70	78	3.76	394	3.00	108	5.20	1,075
24	3.70	56	4.13	54	4.70	80	3.76	394	3.00	108	5.10	1,020
25	3.70	56	4.13	54	4.50	83	3.76	394	3.00	108	5.05	985
26	3.71	56	4.23	54	4.40	86	3.24	180	3.00	108	5.05	980
27	3.81	56	4.23	55	4.40	90	3.50	280	3.00	108	5.05	970
28	3.81	56	4.23	56	4.50	96 <sup>a</sup>	3.50	280	3.00	108	5.00	940
29	3.81	57	.....	.....	4.60	150 <sup>b</sup>	3.50	280	3.00	108	5.00	950
30	3.91	57	.....	.....	5.00	300	3.40	240	3.00	108	5.00	920 <sup>c</sup>
31	3.91	58	.....	.....	5.30	450	.....	.....	3.00	108	.....	.....

a to a Ice conditions.

b Ice breakup March 29 to April 2; discharge estimated.

c Shifting conditions.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon River near Fort Saskatchewan, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.00	921	3.90	410	3.10	110	3.20	138	3.30	170	4.00	115
2.....	4.90	874	3.80	366	3.10	110	3.20	138	3.30	170	4.00	116
3.....	4.90	874	3.75	344	3.10	110	3.20	138	3.30	170	4.00	114
4.....	4.90	874	3.70	322	3.10	110	3.20	138	3.40	204	4.00	112
5.....	4.90	874	3.70	322	3.10	110	3.20	138	3.30	170	4.00	108
6.....	4.80	827	3.70	322	3.10	110	3.20	138	3.30	170	4.00	104
7.....	4.80	827	3.65	302	3.10	110	3.20	138	3.30	170	4.10	104
8.....	4.70	780	3.60	282	3.10	110	3.20	138	3.30	170	4.10	104
9.....	4.70	780	3.60	282	3.10	110	3.20	138	3.45	219 <sup>a</sup>	4.10	102
10.....	4.70	780	3.50	242	3.10	110	3.20	138	3.85	215 <sup>a</sup>	4.10	99
11.....	4.60	733	3.50	242	3.10	110	3.20	138	3.45	210 <sup>a</sup>	4.20	95
12.....	4.60	733	3.50	242	3.10	110	3.20	138	3.85	157 <sup>a</sup>	4.20	90
13.....	4.50	686	3.40	204	3.10	110	3.20	138	4.05	173 <sup>b</sup>	4.20	86
14.....	4.50	686	3.40	204	3.10	110	3.20	138	4.10	156	4.20	85
15.....	4.40	640	3.40	204	3.10	110	3.20	138	3.80	148	4.30	84
16.....	4.40	640	3.35	187	3.10	110	3.20	138	3.80	140	4.30	82
17.....	4.40	640	3.30	170	3.10	110	3.20	138	3.70	128	4.30	82
18.....	4.35	617	3.30	170	3.10	110	3.20	138	3.70	124	4.40	80
19.....	4.30	594	3.30	170	3.10	110	3.20	138	3.80	123	4.40	79
20.....	4.30	594	3.30	170	3.10	110	3.20	138	3.80	123	4.40	78
21.....	4.30	594	3.30	170	3.10	110	3.20	138	3.80	123	4.40	77
22.....	4.30	594	3.20	138	3.10	110	3.20	138	3.80	121	4.40	76
23.....	4.20	548	3.20	138	3.10	110	3.20	138	3.80	118	4.40	75
24.....	4.20	548	3.20	138	3.20	138	3.20	138	3.70	116	4.40	74
25.....	4.20	548	3.20	138	3.20	138	3.20	138	3.70	116	4.40	72
26.....	4.10	502	3.20	138	3.20	138	3.20	138	3.70	116	4.60	72
27.....	4.05	479	3.20	138	3.20	138	3.20	138	3.80	116	4.70	71
28.....	4.00	456	3.20	138	3.20	138	3.20	138	3.80	115	4.80	70
29.....	4.00	456	3.20	138	3.20	138	3.20	138	3.90	114	4.80	69
30.....	4.00	456	3.20	138	3.20	138	3.20	138	3.90	114	4.70	68
31.....	3.90	410	3.20	138	.....	.....	3.20	138	.....	.....	4.80	67

<sup>a</sup> Ice forming; discharge interpolated.

<sup>b</sup> Ice conditions.

## MONTHLY DISCHARGE of Sturgeon River near Fort Saskatchewan, for 1915.

(Drainage area 1,330 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	61	55	58	0.044	0.05	3,566
February.....	61	54	58	0.044	0.05	3,221
March.....	450	55	90	0.068	0.08	5,534
April.....	873	180	531	0.399	0.44	31,597
May.....	240	108	156	0.117	0.13	9,592
June.....	1,075	108	697	0.524	0.58	41,474
July.....	921	410	663	0.499	0.58	40,766
August.....	410	138	216	0.162	0.19	13,281
September.....	138	110	117	0.088	0.10	6,962
October.....	138	138	138	0.104	0.12	8,485
November.....	219	114	150	0.113	0.13	8,926
December.....	116	67	87	0.065	0.07	5,349
The year.....					2.52	178,753

## NORTH SASKATCHEWAN RIVER AT BATTLEFORD.

Location.—North channel, SW  $\frac{1}{4}$  Sec. 33, Tp. 43, Rge. 16, W. 3rd Mer. South channel NE  $\frac{1}{4}$  Sec. 29, Tp. 43, Rge. 16, W. 3rd Mer.

Records available.—May 16, 1911, to December 31, 1915.

*Gauges.*—North channel: Chain; elevation of zero maintained at 1,512.30 feet since establishment. South channel: Chain; elevation of zero maintained at 1,511.88 feet since establishment.

*Bench-marks.*—North channel, on downstream side of left abutment. Elevation, 1,525.66 feet above mean sea level. (Department of Public Works, Canada.) South channel, permanent iron bench-mark on right bank. Elevation, 1,530.72 feet above mean sea level. (Department of Public Works, Canada.)

*Channel.*—Shifts considerably at high stages.

*Discharge measurements.*—From bridge.

*Observer.*—Harold W. Fisher.

DISCHARGE MEASUREMENTS of North Channel of North Saskatchewan River at Battleford, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 8.	F. R. Steinberger	211	660	0.35	2.60	230
Jan. 25.	do	214	613	0.28	2.69	170
Feb. 16.	E. W. W. Hughes	201	567	Plus	2.71	12
Mar. 2.	do	192	549	Nil.	2.67	Nil.
Mar. 18.	do	167	573	"	2.77	
April 9-10.	do	655	2,089	1.85	4.22	3,873
May 5.	do	251	979	1.63	2.45	1,593
July 20-22.	F. K. Beach	1,214	11,889	3.80	11.36	45,192
Aug. 19.	do	974	4,818	2.58	6.30	12,430
Sept. 16-17.	do	1,019	3,131	1.94	4.60	6,060
Oct. 12-13.	do	906	2,255	1.87	3.77	4,218
Nov. 26.	F. R. Steinberger	299	1,454	0.84	2.90	1,219
Dec. 13.	do	297	1,265	0.54	2.75	681
Dec. 27.	do	294	1,217	0.43	2.64	519

DAILY GAUGE HEIGHT AND DISCHARGE of North Channel of North Saskatchewan River at Battleford, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.10	220 <sup>b</sup>	2.80	160	2.75	Nil	4.95	4,500	2.80	1,900	5.68	
2.	2.25	230	2.80	150	2.72	"	4.90	4,780	2.70	1,800	5.70	
3.	2.30	215	2.80	145	2.74	"	4.82	5,020	2.52	1,620	5.76	
4.	2.40	225	2.82	135	2.76	"	4.75	5,150 <sup>b</sup>	2.50	1,600	5.83	
5.	2.55	235	2.82	130	2.75	"	4.90	5,540	2.45	1,560	5.90	
6.	2.65	225	2.80	120	2.75	"	4.83	5,360	2.42	1,540	6.01	
7.	2.60	220	2.77	110	2.75	"	4.80	5,280	2.40	1,520	6.10	
8.	2.62	230	2.75	90	2.75	"	4.49	4,480	2.45	1,560	6.20	
9.	2.64	260	2.76	75	2.80	"	4.07	3,640	2.60	1,700	6.32	
10.	2.68	320	2.75	60	2.77	"	5.60	7,780	2.89	1,990	6.45	
11.	2.70	325	2.75	45	2.75	"	5.35	6,920	3.00		6.68	
12.	2.79	325	2.73	35	2.75	"	4.00	3,500	3.15		7.25	
13.	2.68	320	2.70	20	2.75	"	3.91	3,360	3.30		9.55	
14.	2.71	330	2.68	15	2.75	"	3.80	3,180	3.42		9.30	
15.	2.71	335	2.73	15	2.75	"	3.65	2,940	3.60		9.35	
16.	2.73	340	2.74	13	2.75	"	3.32	2,480	3.62		9.34	
17.	2.73	360	2.75	15	2.78	"	3.25	2,400	3.65		9.18	
18.	2.73	380	2.75	15	2.85	"	3.10	2,220	3.78		9.10	
19.	2.70	360	2.77	30	2.85	"	2.95	2,050	3.90		8.95	
20.	2.71	365	2.80	160	2.85	"		1,940	4.01		8.72	
21.	2.75	360	2.90	230	2.85	"	2.73	1,830	4.25		8.50	
22.	2.73	340	3.15	280		"	2.67	1,770	4.57		8.28	
23.	2.75	230	3.25	310		"	2.65	1,750	5.07		7.97	
24.	2.73	230	3.32	330	2.86	"	2.62	1,720	5.55		7.60	
25.	2.69	170	3.30	330	2.86	"	2.60	1,700	5.52		7.32	
26.	2.70	170	3.06	260	2.90	40	2.60	1,700	5.50		7.09	
27.	2.72	170	3.00	180	3.10	330	2.55	1,650	5.55		6.96	
28.	2.75	170	2.80	80	3.20	520	2.60	1,700	5.57		6.90	
29.	2.75	170			3.55	960		1,900	5.59		8.02 <sup>a</sup>	
30.	2.79	170			4.02	1,620	3.00	2,100	5.60		15.08 <sup>a</sup>	
31.	2.80	165			4.90	3,900			5.65			

a Mean gauge height from frequent readings. Maximum gauge height June 30, 15.60.  
b to b Ice conditions.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of North Channel of North Saskatchewan River at Battleford, for 1915—*Concluded*.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	13.42a		7.48		6.55		3.95		2.97		3.25	1,200
2.....	11.21a		7.37		6.28		3.90		2.96		3.20	1,200
3.....	10.46		7.67		6.17		3.82		2.92		3.20	1,195
4.....	10.38		7.49		6.17		3.75		2.89		3.15	1,180
5.....	10.34		7.52		5.99		3.73		2.85		3.14	1,160
6.....	9.40		7.63		5.85		3.70				3.10	1,120
7.....	8.75		7.58		5.75		3.75		2.87		3.05	1,080
8.....	8.45		7.45		5.55		3.77		2.85		3.05	1,040
9.....	8.40		7.40		5.37		3.78		3.82		3.01	1,000
10.....	8.38		7.35		5.20		3.80		2.80		3.00	970
11.....	8.25		6.96		5.40		3.82		2.81		2.95	890
12.....	8.40		6.80		5.27		3.82		2.80		2.90	830
13.....	8.05		6.75		5.14		3.74		2.85		2.75	680
14.....	7.80		6.70		4.93		3.70		3.85		2.70	620
15.....	7.72		6.60		4.80		3.63		3.13		2.68	610
16.....	7.68		6.50		4.64		3.58		3.10		2.70	600
17.....	7.46		6.45		4.54		3.50		3.10		2.70	600
18.....	10.60		6.39		4.34		3.45		3.09		2.70	600
19.....	12.33		6.33		4.25		3.40		3.07		2.70	600
20.....	11.60		6.29		4.15		3.35		3.05		2.68	590
21.....	11.44		6.26		4.10		3.31		3.05		2.68	580
22.....	11.10		6.25		4.05		3.25		3.05		2.66	550
23.....	10.46		6.30		4.00		3.05		3.05		2.65	530
24.....	10.05		7.58		3.97		3.02		3.00		2.65	520
25.....	9.35		8.90		4.03		3.00		2.95			520
26.....	9.05		8.50		4.07		3.05		2.95		2.65	520
27.....	8.92		7.80		4.05		3.06		3.05		2.64	520
28.....	8.57		7.32		3.98		3.08		3.20		2.64	515
29.....	8.22		7.14		3.95		3.05		3.20		2.64	515
30.....	7.96		6.96		3.90		3.03		3.20		2.64	515
31.....	7.70		6.90				3.00				2.64	515

a Mean gauge height from frequent readings.

MONTHLY DISCHARGE of North Channel of North Saskatchewan River at Battleford, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	380	165	263			16,171
February.....	330	13	126			6,998
March.....	3,900	Nil	238			14,634
April.....	7,780	1,650	3,345			199,041
May (1-10).....	1,990	1,520	1,670			33,302
June.....						
July.....						
August.....						
September.....						
October.....						
November.....						
December.....	1,200	515	760			46,731
The period.....						316,877

## DISCHARGE MEASUREMENTS of South Channel of North Saskatchewan River at Battleford, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 9.	F. R. Steinberger	138	942	1.62	4.54	1,525
Jan. 26-27.	do	134	817	1.52	4.50	1,243
Feb. 16.	E. W. W. Hughes	140	873	1.52	4.70	1,335
Mar. 2.	do	141	865	1.44	4.71	1,274
Mar. 18.	do	143	859	1.45	4.68	1,248
April 8.	do	401	3,722	1.27	5.70	4,738
May 5.	do	383	1,853	1.70	4.15	3,158
July 17.	F. K. Beach	540	4,441	2.75	8.24	12,213
Aug. 20.	do	510	3,150	3.01	6.92	9,481
Sept. 17.	do	303	2,152	2.59	5.04	5,552
Oct. 13.	do	297	1,550	2.78	4.47	4,304
Nov. 27.	F. R. Steinberger	365	1,218	0.89	4.56	1,085
Dec. 14.	do	178	944	1.19	4.43	1,120
Dec. 28.	do	175	796	1.31	4.14	1,044

## DAILY GAUGE HEIGHT AND DISCHARGE of South Channel of North Saskatchewan River at Battleford, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	3.90	1,500 <sup>b</sup>	4.68	1,340	4.75	1,280	5.90	4,530	4.90	3,770	6.95	.....
2.	3.91	1,515	4.68	1,350	4.75	1,275	5.84	4,640	4.75	3,650	6.98	.....
3.	3.97	1,490	4.68	1,350	4.75	1,280	5.76	4,690	4.35	3,330	7.04	.....
4.	4.00	1,495	4.67	1,340	4.77	1,280	5.69	4,750 <sup>b</sup>	4.25	3,250	7.10	.....
5.	4.20	1,520	4.65	1,335	4.77	1,285	5.85	5,010	4.20	3,210	7.15	.....
6.	4.39	1,525	4.65	1,340	4.80	1,300	5.70	4,770	4.15	3,170	7.25	.....
7.	4.47	1,510	4.69	1,350	4.78	1,320	5.65	4,690	4.13	3,154	7.36	.....
8.	4.47	1,510	4.70	1,360	4.80	1,340	5.63	4,660	4.20	3,210	7.47	.....
9.	4.55	1,525	4.71	1,370	4.85	1,365	5.40	4,330	4.32	3,306	7.60	.....
10.	4.57	1,540	4.73	1,365	4.85	1,365	6.75	7,025	4.57	3,506	7.75	.....
11.	4.60	1,555	4.73	1,360	4.82	1,350	6.55	6,485	4.61	.....	7.95	.....
12.	4.58	1,545	4.73	1,360	4.80	1,345	5.45	4,390	4.74	.....	9.22	.....
13.	4.58	1,520	4.74	1,350	4.80	1,340	5.35	4,270	4.85	.....	10.20	.....
14.	4.55	1,480	4.75	1,345	4.80	1,340	5.26	4,162	4.95	.....	10.02	.....
15.	4.52	1,440	4.75	1,340	4.80	1,335	5.00	3,850	5.10	.....	10.10	.....
16.	4.52	1,420	4.75	1,335	4.80	1,325	4.68	3,594	5.12	.....	10.10	.....
17.	4.50	1,410	4.75	1,340	4.75	1,290	4.63	3,554	5.15	.....	9.96	.....
18.	4.50	1,400	4.75	1,340	4.68	1,250	4.58	3,514	5.18	.....	9.95	.....
19.	4.52	1,400	4.77	1,345	4.68	1,250	4.55	3,490	5.20	.....	9.81	.....
20.	4.55	1,400	4.80	1,350	4.68	1,255	.....	3,450	5.29	.....	9.60	.....
21.	4.55	1,370	4.75	1,350	4.68	1,260	4.43	3,394	5.52	.....	9.38	.....
22.	4.50	1,335	4.75	1,340	.....	1,270	4.38	3,354	5.85	.....	9.15	.....
23.	4.50	1,300	4.75	1,335	.....	1,280	4.37	3,346	6.34	.....	8.85	.....
24.	4.50	1,270	4.75	1,325	4.75	1,290	4.35	3,330	6.84	.....	8.50	.....
25.	4.50	1,240	4.75	1,320	4.78	1,310	4.35	3,330	6.80	.....	8.35	.....
26.	4.50	1,240	4.80	1,310	4.78	1,310	4.32	3,306	6.78	.....	8.20	.....
27.	4.60	1,245	4.77	1,300	4.80	1,310	4.30	3,290	6.78	.....	8.12	.....
28.	4.62	1,260	4.75	1,290	4.95	1,530	4.40	3,370	6.84	.....	8.05	.....
29.	4.65	1,280	.....	.....	5.20	2,265	.....	3,590 <sup>c</sup>	6.85	.....	9.04 <sup>a</sup>	.....
30.	4.65	1,290	.....	.....	5.58	3,250	4.95	3,810	6.85	.....	15.21 <sup>a</sup>	.....
31.	4.67	1,315	.....	.....	5.95	4,390	.....	.....	6.91	.....	.....	.....

<sup>a</sup> Mean gauge height from frequent readings. Maximum gauge height June 30, 15.80.<sup>b-b</sup> Ice conditions.



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of South Channel of North Saskatchewan River, at Battleford, for 1915—*Concluded*.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	14.24 <sub>a</sub>		8.15		7.12		4.50		3.66		4.80	1,100
2.	11.73 <sub>a</sub>		8.03		6.85		4.47		3.68		4.80	1,110
3.	11.04		8.32		6.75		4.40		3.64		4.78	1,115
4.	11.02		8.14		6.68		4.33		3.61		4.75	1,120
5.	11.01		8.16		6.55		4.35		3.60 <sub>b</sub>		4.75	1,125
6.	10.40		8.25		6.45		4.30				4.72	1,130
7.	9.73		8.20		6.37		4.37		3.70		4.70	1,130
8.	9.40		8.07		6.22		4.40		3.87		4.67	1,130
9.	9.35		8.00		6.08		4.42		3.85		4.65	1,135
10.	9.34		7.95		5.95		4.45		3.57		4.62	1,135
11.	9.21		7.55		5.95		4.51		3.55		4.60	1,130
12.	9.00		7.47		5.80		4.58		3.55		4.59	1,130
13.	8.90		7.46		5.65		4.47		3.52		4.50	1,125
14.	8.66		7.41		5.52		4.40		4.60		4.44	1,120
15.	8.56		7.32		5.37		4.34		4.48		4.35	1,120
16.	8.55		7.25		5.21		4.28		4.45		4.35	1,100
17.	8.24		7.05		5.04		4.19		4.42		4.32	1,080
18.	11.50		6.94		4.88		4.15		4.42		4.30	1,070
19.	13.20		6.90		4.80		4.10		4.40		4.30	1,060
20.	12.26		6.92		4.75		4.05		4.38		4.28	1,060
21.	12.17		6.90		4.70		4.00		4.39		4.25	1,055
22.	11.82		6.88		4.65		3.96		4.38		4.25	1,055
23.	10.96		6.95		4.60		3.75		4.45		4.20	1,055
24.	10.55		8.29		4.56		3.72		4.38		4.20	1,050
25.	10.05		9.59		4.60		3.71		4.37			1,050
26.	9.76		9.15		4.64		3.75		4.35		4.15	1,045
27.	9.55		8.40		4.62		3.78		4.56		4.15	1,045
28.	9.18		7.90		4.55		3.80		4.79		4.14	1,045
29.	8.86		7.72		4.51		3.76				4.14	1,045
30.	8.62		7.53		4.47		3.73				4.15	1,050
31.	8.36		7.47				3.69				4.13	1,055 <sub>b</sub>

*a* Mean gauge height and discharge from frequent readings.

*b* to *b* Ice conditions.

MONTHLY DISCHARGE of South Channel of North Saskatchewan River at Battleford, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	1,555	1,240	1,414			86,944
February	1,370	1,290	1,341			74,475
March	4,390	1,250	1,504			92,477
April	7,025	3,290	4,132			245,930
May (1-10)	3,770	3,154	3,356			66,565
June						
July						
August						
September						
October						
November						
December	1,135	1,045	1,090			67,022
The period						633,413

NOTE.—The following corrections should be made in the table of monthly discharge of the South Channel of the North Saskatchewan River at Battleford, for 1914:—The total run-off for the month of June should be 842,340 acre-feet, not 1,040,592 acre-feet, and the total run-off for the year should be 3,779,519 acre-feet.



## MONTHLY DISCHARGE of North Saskatchewan River at Battleford, for 1915.

(Drainage area 27,100 (a) square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Persquare Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,880	1,410	1,677	0.0619	0.07	103,115
February.....	1,655	1,348	1,467	0.0541	0.06	81,473
March.....	8,290	1,250	1,742	0.0643	0.07	107,112
April.....	14,805	4,940	7,477	0.2759	0.31	444,971
May (1-10).....	5,670	4,674	5,035	0.1858	0.21	99,867
June.....						
July.....						
August.....						
September.....						
October.....						
November.....						
December.....	2,500	1,560	1,850	0.0683	0.08	113,753
The period.....					0.80	959,179

a The drainage area given in this table is only approximate. It must be remembered that the greater part of the run-off at this station is derived from the eastern slope of the Rocky Mountains and must not be used to base estimates of run-off on other streams in the vicinity of Battleford.

No discharge estimates are made for dates between May 10, 1915 and December 1, 1915, owing to rapidly shifting conditions in the channels, and to the fact that measurements were not secured frequently enough to follow changes which it is believed occurred owing to unusually high stages.

## PIGEON CREEK NEAR WESTEROSE.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 15, Tp. 46, Rge. 28, W. 4th Mer., at the traffic bridge near outlet of Pigeon Lake and on the trail from Wetaskiwin to Westerose post office.

*Records available.*—Discharge measurements only made during 1912, 1913 and 1914. Gauge readings every three days March 24, 1915, to October 31, 1915, and records computed for that period.

*Gauge.*—Vertical staff spiked to a post in creek on downstream side of bridge. Zero elevation maintained at 93.36 feet.

*Bench-mark.*—On a spike in a pile at the SW. corner of the bridge; assumed elevation 100.00 feet. Permanent iron bench-mark at SW. corner of bridge. Elevation, 100.23 feet.

*Channel.*—Permanent, sand and gravel.

*Discharge measurements.*—Made by wading near the bridge.

*Winter flow.*—The creek is partly open all winter and measurements are made by wading. *Artificial control.*—Dam at outlet of lake fitted with two gates and a fishway. Owing to logs lodging in the creek below the dam, the control was changed in July.

*Observer.*—L. J. Wood, appointed March 24, and took readings at intervals of two or three days. All intermediate gauge heights were interpolated from the observed readings. Gauge readings were discontinued on October 31, 1915.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Pigeon Creek near Westeros, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 7.....	H. B. R. Thompson.....	18.0	10.7	1.57	3.14	16.8
Jan. 24.....	do.....	18.3	13.5	1.32	3.17	17.7
Feb. 25.....	do.....	17.4	11.5	1.37	3.05	15.8
Mar. 12.....	do.....	17.1	10.4	1.33	3.00	13.8
Mar. 23.....	J. M. Paul.....	17.0	9.6	1.26	3.00	12.0
April 20.....	I. R. Strome.....	18.0	13.1	1.50	2.99	19.6
May 7.....	do.....	17.7	9.3	1.44	2.61	13.4
May 28.....	do.....	20.0	17.5	1.54	3.28	27.0
June 15.....	do.....	21.0	18.4	1.46	3.28	27.0
July 14.....	do.....	46.0	88.0	1.14	5.13	100.0
Aug. 30.....	do.....	16.0	7.9	0.85	2.91	6.7
Sept. 19.....	do.....	17.0	8.6	1.06	2.97	9.2
Oct. 4.....	do.....	16.0	6.2	0.88	2.80	5.5
Oct. 21.....	do.....	12.0	4.2	0.80	2.72	3.4

## DAILY GAUGE HEIGHT AND DISCHARGE of Pigeon Creek near Westeros, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			3.05a	15.0	3.14a	22.0	3.16a	23.0
2.....			3.05	15.4	3.15	23.0	3.10a	21.0
3.....			3.05a	15.6	3.15a	23.0	3.06a	20.0
4.....			3.05a	16.0	3.15a	23.0	3.02a	18.7
5.....			3.05a	16.2	3.16a	23.0	2.98	17.5
6.....			3.05a	16.4	3.16	23.0	3.04a	19.3
7.....			3.05	16.6	3.07a	20.0	3.10a	21.0
8.....			3.05a	17.0	2.98	17.5	3.16a	23.0
9.....			3.05	17.2	2.98a	17.5	3.22a	25.0
10.....			3.04a	17.2	2.97a	17.2	3.28	27.0
11.....			3.04a	17.6	2.97a	17.2	3.38a	30.0
12.....			3.03a	17.4	2.96a	16.9	3.48	34.0
13.....			3.02	17.2	2.95	16.6	3.40a	31.0
14.....			3.02a	17.6	3.00a	18.1	3.32a	28.0
15.....			3.01a	17.6	3.05	19.7	3.23	25.0
16.....			3.00a	17.6	3.00a	18.1	3.24a	26.0
17.....			3.00	17.7	2.95	16.6	3.25a	26.0
18.....			3.00a	17.8	2.90a	15.2	3.26	26.0
19.....			2.99a	17.5	2.85	13.7	3.27a	27.0
20.....			2.99	17.6	2.87a	14.3	3.28a	27.0
21.....			2.99a	17.8	2.89a	14.9	3.30a	28.0
22.....			2.98	17.5	2.92	15.8	3.32a	28.0
23.....			3.04a	19.3	2.96a	16.9	3.34a	29.0
24.....	3.00	12.0	3.10	21.0	3.00a	18.1	3.35	29.0
25.....	3.00a	12.2	3.10a	21.0	3.04a	19.3	3.47a	34.0
26.....	3.01a	12.4	3.10a	21.0	3.08a	21.0	3.58	37.0
27.....	3.02a	13.2	3.10a	21.0	3.12	22.0	3.67a	41.0
28.....	3.03	13.6	3.10a	21.0	3.20a	24.0	3.74a	44.0
29.....	3.04a	14.0	3.10	21.0	3.29	27.0	3.83a	48.0
30.....	3.04a	14.4	3.12a	22.0	3.24	26.0	3.93	51.0
31.....	3.05	14.8			3.20a	24.0		

a Gauge height interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of Pigeon Creek near Westeros, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.08 <sub>a</sub>	54	5.35 <sub>a</sub>	110	2.84	6.8	2.81 <sub>a</sub>	5.9
2.....	4.22 <sub>a</sub>	62	5.33	109	2.80 <sub>a</sub>	5.6	2.81 <sub>a</sub>	5.9
3.....	4.31	66	5.33	109	2.77	4.8	2.81	5.9
4.....	4.20 <sub>a</sub>	61	5.33 <sub>a</sub>	109	2.77	4.8	2.77 <sub>a</sub>	4.8
5.....	4.10 <sub>a</sub>	57	5.32	108	2.77 <sub>a</sub>	4.8	2.73 <sub>a</sub>	3.8
6.....	4.00 <sub>a</sub>	54	5.30 <sub>a</sub>	108	2.77 <sub>a</sub>	4.8	2.68	2.5
7.....	3.89	49	5.28	107	2.77	4.8	2.70 <sub>a</sub>	3.0
8.....	4.30 <sub>a</sub>	65	5.25 <sub>a</sub>	105	2.77 <sub>a</sub>	4.8	2.72 <sub>a</sub>	3.5
9.....	4.70 <sub>a</sub>	82	5.23	104	2.77	4.8	2.75	4.3
10.....	5.08	98	4.70 <sub>a</sub>	81	2.79 <sub>a</sub>	5.3	2.74 <sub>a</sub>	4.0
11.....	5.08	98	4.19	59	2.81 <sub>a</sub>	5.9	2.74	4.0
12.....	5.10 <sub>a</sub>	99	4.16 <sub>a</sub>	58	2.83 <sub>a</sub>	6.5	2.74 <sub>a</sub>	4.0
13.....	5.12 <sub>a</sub>	100	4.12 <sub>a</sub>	56	2.85 <sub>a</sub>	7.1	2.74 <sub>a</sub>	4.0
14.....	5.13	100	4.08	54	2.87 <sub>a</sub>	7.7	2.73 <sub>a</sub>	3.8
15.....	5.21 <sub>a</sub>	104	3.80 <sub>a</sub>	42	2.88	8.0	2.73 <sub>a</sub>	3.8
16.....	5.30	108	3.52 <sub>a</sub>	31	2.91 <sub>a</sub>	8.9	2.73	3.8
17.....	5.36 <sub>a</sub>	110	3.24 <sub>a</sub>	20	2.94 <sub>a</sub>	10.0	2.70 <sub>a</sub>	3.0
18.....	5.42	113	2.98	11.3	2.96	10.6	2.68 <sub>a</sub>	2.5
19.....	5.44 <sub>a</sub>	114	2.99 <sub>a</sub>	11.7	2.97 <sub>a</sub>	10.0	2.65	1.8
20.....	5.46	115	3.00 <sub>a</sub>	12.0	2.90 <sub>a</sub>	8.6	2.68 <sub>a</sub>	2.5
21.....	5.46 <sub>a</sub>	115	3.01	12.4	2.83	6.5	2.72 <sub>a</sub>	3.5
22.....	5.47 <sub>a</sub>	115	2.95	10.3	2.83 <sub>a</sub>	6.5	2.68	2.5
23.....	5.47	115	2.94 <sub>a</sub>	10.0	2.83 <sub>a</sub>	6.5	2.69	2.8
24.....	5.44 <sub>a</sub>	114	2.93 <sub>a</sub>	9.6	2.83	6.5	2.70 <sub>a</sub>	3.0
25.....	5.42 <sub>a</sub>	113	2.91 <sub>a</sub>	8.9	2.82 <sub>a</sub>	6.2	2.70 <sub>a</sub>	3.0
26.....	5.40 <sub>a</sub>	112	2.90 <sub>a</sub>	8.6	2.81 <sub>a</sub>	5.9	2.70 <sub>a</sub>	3.0
27.....	5.37	111	2.89	8.3	2.80	5.6	2.71	3.3
28.....	5.37 <sub>a</sub>	111	2.90 <sub>a</sub>	8.6	2.81 <sub>a</sub>	5.9	2.71 <sub>a</sub>	3.3
29.....	5.38	111	2.90 <sub>a</sub>	8.6	2.82	6.2	2.70	3.0
30.....	5.38 <sub>a</sub>	111	2.91	8.9	2.82 <sub>a</sub>	6.2	2.69 <sub>a</sub>	2.8
31.....	5.37	111	2.88 <sub>a</sub>	8.0	.....	.....	2.68	2.5

*a* Gauge height interpolated.

## MONTHLY DISCHARGE of Pigeon Creek near Westeros, for 1915.

(Drainage area 122 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (24-31).....	14.8	12.0	13.3	0.109	0.03	211
April.....	22.0	15.0	18.0	0.148	0.16	1,071
May.....	27.0	13.7	19.5	0.160	0.18	1,199
June.....	51.0	17.5	29.0	0.238	0.27	1,726
July.....	115.0	49.0	95.0	0.779	0.90	5,841
August.....	110.0	8.0	49.0	0.402	0.46	3,013
September.....	10.9	4.8	6.6	0.054	0.06	393
October.....	5.9	1.8	3.5	0.029	0.03	215
The period.....					2.09	13,669

## BATTLE RIVER AT PONOKA.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 4, Tp. 43, Rge. 25, W. 4th Mer., at the steel traffic bridge, 300 yards southeast of the C.P.R. depot in the town of Ponoka.

*Records available.*—May 7, 1913, to December 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 88.31 since establishment.

*Bench-mark.*—Permanent iron bench-mark located beside outside pile on upstream side of left abutment. Assumed elevation, 100.00 feet.

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*Channel.*—One, slightly shifting.

*Discharge measurements.*—Made from bridge, and in low stages by wading at a point 300 feet upstream.

*Winter flow.*—Stream affected by ice from November to April, and measurements are made at a point 300 feet upstream from bridge.

*Observer.*—G. R. Edwards.

## DISCHARGE MEASUREMENTS of Battle River at Ponoka, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 4.	P. H. Daniels.	21	26	1.29	3.01	34.0
Jan. 25.	R. J. McGuinness.	57	72	0.34	3.11	25.0
Feb. 26.	do	52	35	0.39	3.11	13.7
Mar. 22.	J. M. Paul.	67	145	0.32	7.61	47.0
April 19.	I. R. Strome.	74	68	1.55	3.15	106.0
May 6.	do	68	266	0.37	3.15	97.0
May 26.	do	72	307	0.53	3.68	162.0
May 27.	do	78	107	2.29	4.27	245.0
June 14.	do	86	708	1.48	8.57	1,051.0
July 13.	do	86	622	1.44	7.81	897.0
July 29.	do	83	506	1.32	6.84	676.0
Aug. 31.	do	63	190	0.31	2.82	60.0
Sept. 20.	do	64	198	0.47	2.93	91.0
Oct. 5.	do	68	225	0.58	3.36	130.0
Oct. 22.	do	64	192	0.35	2.85	68.0
Nov. 9.	J. M. Paul.	64	49	1.16	2.58	57.0
Dec. 1.	do	30	23	1.00	2.60	23.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Battle River at Ponoka, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	2.98	32a	3.00	20	3.06	14	5.12	128	3.15	100	4.25	237
2.	2.98	33	3.00	19	3.01	15	4.87	137	3.15	100	5.35	409
3.	2.98	34	3.00	20	3.06	15	4.86	146	3.15	100	8.10	949
4.	3.00	34	2.85	20	3.06	16	4.91	154	3.15	100	8.70	1,078
5.	2.95	33	2.80	20	3.06	17	4.90	164	3.15	100	11.78	1,797
6.	2.95	32	2.80	20	3.08	18	4.70	174	3.15	100	12.40	1,968
7.	3.00	32	2.85	19	3.08	10	4.49	184a	3.05	90	11.68	1,773
8.	2.97	32	2.85	19	3.08	20	3.94	194	3.05	90	10.60	1,514
9.	3.00	33	2.85	18	3.09	21	3.98	199	3.00	86	8.80	1,100
10.	2.98	33	2.85	18	3.09	22	3.78	172	3.00	86	7.60	844
11.	3.01	33	2.85	18	3.10	23	3.72	165	3.00	86	7.95	917
12.	3.00	31	2.90	18	3.10	23	3.46	134	3.05	90	8.25	980
13.	3.00	29	2.90	17	3.10	22	3.50	138	3.05	90	8.55	1,045
14.	3.00	27	2.90	18	3.11	22	3.49	137	3.05	90	8.55	1,045
15.	3.01	25	2.85	18	3.22	24	3.43	130	3.20	105	7.95	917
16.	3.01	24	2.90	18	3.23	27	3.42	129	3.25	111	7.05	730
17.	3.01	25	2.95	17	3.43	31	3.36	123	3.40	127	6.60	640
18.	3.01	26	2.90	16	3.48	35	3.30	116	3.45	133	6.80	680
19.	3.03	27	2.90	15	4.79	39	3.15	100	3.35	122	7.00	730
20.	3.05	27	2.90	15	5.05	38	3.15	100	3.30	116	6.85	690
21.	3.05	26	2.92	15	5.76	42	3.15	100	3.20	105	6.45	610
22.	3.05	26	2.87	14	7.52	47	3.15	100	3.15	100	6.10	544
23.	3.05	25	2.87	14	8.42	55	3.25	111	3.20	105	5.85	499
24.	3.08	25	2.87	14	8.76	63	3.30	116	3.15	100	5.75	481
25.	3.10	25	2.82	14	8.76	71	3.35	122	3.1	100	5.55	445
26.	3.10	24	3.09	14	7.40	79	3.35	122	3.75	168	5.85	495
27.	3.10	24	3.04	14	7.10	87	3.30	116	4.25	237	7.85	896
28.	3.10	23	3.04	14	5.74	95	3.20	105	4.35	251	8.75	1,099
29.	3.10	22			5.74	103	3.25	111	4.20	230	10.30	1,449
30.	3.00	21			5.38	111	3.20	105	4.65	296	11.34	1,692
31.	3.00	20			5.38	119			4.50	273		

a to a Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Battle River at Ponoka, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	11.05	1,622	5.70	472	2.78	67	2.85	72	2.70	61	2.60	23
2.....	10.33	1,449	5.60	454	2.78	67	2.95	81	2.65	58	2.60	23
3.....	9.40	1,234	5.10	366	2.75	65	3.15	100	2.27	37	2.65	22
4.....	7.50	823	4.85	326	2.73	63	3.30	116	2.70	61	3.00	22
5.....	6.40	600	4.65	296	2.70	61	3.40	127	2.90	77	2.65	21
6.....	5.95	517	4.45	266	2.75	65	3.27	113	2.38	42	2.63	20
7.....	6.10	544	4.35	251	2.78	67	3.20	105	2.70	466	2.65	20
8.....	6.50	620	4.30	244	2.80	68	3.10	95	2.65	51	2.65	19
9.....	6.65	650	4.25	237	2.80	68	3.05	90	2.60	57	2.65	18
10.....	6.85	690	4.10	216	2.75	65	3.03	89	2.52	55	2.65	18
11.....	7.30	781	4.00	202	2.75	65	3.00	86	2.52	54	2.68	17
12.....	7.70	865	3.85	181	2.75	65	2.98	84	2.55	52	2.70	16
13.....	7.80	886	3.80	175	2.75	65	2.95	81	2.55	50	2.73	16
14.....	7.70	865	3.65	156	2.75	65	2.95	81	2.55	49	2.75	16
15.....	8.10	949	3.45	133	2.75	65	2.95	81	2.55	47	2.75	16
16.....	8.90	1,122	3.40	127	2.78	67	2.95	81	2.55	45	2.70	17
17.....	9.70	1,303	3.35	122	2.98	84	2.90	77	2.55	44	2.80	17
18.....	11.26	1,672	3.30	116	2.98	84	2.85	72	2.55	42	2.75	17
19.....	12.04	1,860	3.30	116	2.95	81	2.80	68	2.55	40	2.75	17
20.....	11.93	1,833	3.40	127	2.93	80	2.80	68	2.55	39	2.78	18
21.....	11.25	1,670	3.30	116	2.93	80	2.85	72	2.55	38	2.78	18
22.....	10.48	1,485	3.25	111	2.93	80	2.85	72	2.55	36	3.25	17
23.....	9.80	1,326	3.10	95	2.85	72	2.83	71	2.55	35	3.35	16
24.....	10.33	1,449	3.05	90	2.87	74	2.80	71	2.55	33	2.85	16
25.....	10.93	1,593	2.95	81	2.85	72	2.80	71	2.55	30	2.79	15
26.....	9.70	1,303	2.95	81	2.85	72	2.80	71	2.55	29	2.82	15
27.....	8.60	1,056	2.95	81	2.90	77	2.80	71	2.55	27	2.82	14
28.....	7.50	823	2.85	72	2.95	81	2.80	71	2.55	26	2.84	14
29.....	6.85	690	2.85	72	2.90	77	2.80	71	2.55	24	2.86	13
30.....	6.55	630	2.85	72	2.85	72	2.78	67	2.00	24	2.83	13
31.....	6.05	535	2.80	68	.....	.....	2.75	65	.....	.....	2.84	126

 $b_{\frac{1}{2}}$  to  $b$  Ice conditions.

## MONTHLY DISCHARGE of Battle River at Ponoka, for 1915.

(Drainage area 670 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	34	20	28	0.042	0.05	1,722
February.....	20	14	17	0.025	0.03	944
March.....	119	14	43	0.064	0.07	2,644
April.....	199	100	134	0.200	0.22	7,974
May.....	296	86	129	0.192	0.22	7,932
June.....	1,968	237	941	1.404	1.57	55,993
July.....	1,860	517	1,079	1.610	1.86	66,346
August.....	472	68	178	0.266	0.31	10,945
September.....	84	61	71	0.106	0.12	4,225
October.....	127	65	82	0.122	0.14	5,042
November.....	77	24	44	0.066	0.07	2,618
December.....	23	12	17	0.025	0.03	1,045
The year.....	.....	.....	.....	.....	4.69	167,430

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## BATTLE RIVER AT BATTLEFORD.

*Location.*—Lower station on the SE.  $\frac{1}{4}$  Sec. 19, Tp. 43, Rge. 16, W. 3rd Mer., at the traffic bridge about one and one-quarter miles south of Canadian Northern Railway station at Battleford. Upper station on the NW.  $\frac{1}{4}$  Sec. 25, Tp. 43, Rge. 17, W. 3rd Mer., at the traffic bridge about one mile west of the Canadian Northern Railway station at Battleford.

*Records available.*—June 17, 1911, to December 31, 1915. Lower station abandoned June 20, 1915. Observations for 1915 at upper station start April 1.

*Gauge.*—Upper station, chain gauge 200 feet from initial point of soundings. Zero elevation maintained at 83.89 feet since establishment (May 23, 1914).

*Bench-mark.*—On top of abutment, downstream side of west end of bridge. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—From bridge.

*Winter flow.*—Lower station used winter of 1914-15. Upper station used winter of 1915-16.

*Observers.*—At lower station, C. J. Johnston; at upper station, H. J. Ghent, April 1 to August 28; R. L. Robson, September 15, to December 31.

*Remarks.*—Several gaps in gauge height observations.

## DISCHARGE MEASUREMENTS of Battle River at Battleford, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 7.....	F. R. Steinberger..... <i>a</i>	95.5	129	0.80	4.58	116
Jan. 23.....	do..... <i>a</i>	87.0	107	0.85	4.65	91
Feb. 17.....	E. W. W. Hughes..... <i>a</i>	52.0	79	0.90	4.66	72
Mar. 1.....	do..... <i>a</i>	49.0	83	0.77	4.75	64
Mar. 19.....	do..... <i>a</i>	59.0	88	0.78	4.80	69
April 7.....	do..... <i>b</i>	207.0	945	2.12	7.18	2,005
May 6.....	do..... <i>a</i>	140.0	266	2.02	4.50	537
May 6.....	do..... <i>b</i>				3.93	537
July 23.....	F. K. Beach..... <i>b</i>	209.5	1,027	2.67	7.64	2,740
Aug. 18.....	do..... <i>b</i>	201.0	635	2.52	5.85	1,599
Sept. 15.....	do..... <i>b</i>	174.3	281	2.07	4.00	581
Oct. 12.....	do..... <i>b</i>	129.0	237	1.88	3.63	446
Nov. 8.....	F. R. Steinberger..... <i>b</i>	199.0	426	0.32	4.40	139
Nov. 25.....	do..... <i>b</i>	134.0	193	1.06	3.89	206
Dec. 15.....	do..... <i>b</i>	126.0	108	1.00	3.44	109
Dec. 29.....	do..... <i>b</i>	124.0	81	0.95	3.40	77

*a* Lower station.

*b* Upper station.

## DAILY GAUGE HEIGHT AND DISCHARGE of Battle River at Battleford, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.60 <sup>a</sup>	130	4.67	90	4.75	64	5.60	290	4.15	635	3.83	510
2.....	4.60	135	4.66	89	4.74	64	6.91	400	4.15	635	3.81	505
3.....	4.58	128	4.66	86	4.74	65	7.30	440	4.02	580	3.80	500
4.....	4.55	124	4.65	84	4.80	70	9.17	1,000	3.95	555	3.94	550
5.....	4.54	120	4.63	81	4.83	76	11.69	2,000	3.90	535	3.98	565
6.....	4.52	118	4.62	79	4.87	85	12.32	2,000	3.93	545	4.15	635
7.....	4.58	116	4.62	76	4.89	85	10.04	2,005	3.85	520	4.08	605
8.....	4.60	113	4.62	74	4.88	85	6.65 <sup>a</sup>	2,050	3.79	500	4.11	615
9.....	4.65	112	4.62	72	4.89	85	7.07	2,350	3.75	485	4.10	610
10.....	4.69	110	4.63	72	4.87	82	7.08	2,355	3.72	475	4.12	620
11.....	4.70	109	4.62	72	4.89	84	7.01	2,305	3.70	470	4.28	690
12.....	4.70	107	4.61	66	4.90	85	6.86	2,205	3.70	470	4.32	705
13.....	4.68	105	4.59	64	4.80	70	6.50	1,960	3.71	470	4.38	730
14.....	4.68	104	4.60	64	4.80	70	6.34	1,855	3.84	515	4.49	775
15.....	4.68	102	4.63	64	4.81	70	6.16	1,735	3.77	490	4.56	810
16.....	4.68	100	4.63	67	4.80	70	6.00	1,630	3.73	480	4.60	830
17.....	4.67	99	4.66	72	4.79	70	5.87	1,545	3.70	470	4.75	900
18.....	4.66	97	4.66	75	4.78	70	5.47	1,295	3.62	440	4.84	945
19.....	4.66	95	4.67	76	4.80	69	5.30	1,195	3.64	450	5.02	1,030
20.....	4.66	94	4.66	73	4.80	66	5.10	1,080	3.60	435	5.30	1,195
21.....	4.66	93	4.68	64	4.73	60	5.00	1,020	3.65	450	5.40	1,250
22.....	4.65	92	4.69	65	4.82	75	4.90	970	3.80	500	5.48	1,300
23.....	4.65	91	4.70	66	4.88	110	4.59	825	3.70	470	5.50	1,310
24.....	4.68	92	4.70	65	5.80	265	4.70	875	3.72	475	5.55	1,340
25.....		93	4.72	65	6.60	445	4.55	805	3.69	465	5.60	1,375
26.....		93	4.72	64	6.41	425	4.50	780	3.68	460	5.68	1,425
27.....		92	4.72	64	6.16	405	4.48	770	3.67	460	5.70	1,440
28.....		90	4.74	64	6.15	380	4.40	740	3.70	470	5.80	1,500
29.....	4.65	89			6.01	360	4.39	735	3.74	480	5.93	1,585
30.....	4.67	90			5.84	335	4.25	675	3.90	535	7.57 <sup>b</sup>	1,550
31.....	4.68	91			5.80	315			3.85	520		

<sup>a</sup>-<sup>a</sup> Ice conditions. Observations at lower station.<sup>b</sup> Backwater from North Saskatchewan River.



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Battle River at Battleford, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	7.48 <sup>b</sup>	1,510	6.99	2,295	.....	1,180	3.86	520	3.60	435	3.65	150
2.....	5.75	1,470	6.94	2,260	.....	1,135	3.86	520	3.62	440	3.63	143
3.....	5.72	1,450	6.90	2,230	.....	1,095	3.81	505	3.65	450	3.60	135
4.....	5.60	1,375	6.91	2,240	.....	1,050	3.79	500	3.65	450	3.56	125
5.....	5.58	1,360	6.94	2,260	.....	1,005	3.78	495	3.60 <sup>a</sup>	435	3.52	117
6.....	5.64	1,400	6.95	2,265	.....	965	3.81	505	3.55	330	3.53	113
7.....	5.69	1,430	6.94	2,260	.....	920	3.77	490	.....	235	3.50	113
8.....	5.72	1,450	.....	2,205	.....	875	3.75	485	4.40	139	3.43	103
9.....	5.80	1,500	.....	2,150	.....	845	3.71	470	.....	142	3.46	103
10.....	5.93	1,585	.....	2,095	.....	790	3.69	465	.....	146	3.48	105
11.....	6.02	1,645	.....	2,040	.....	745	3.67	460	.....	150	3.48	106
12.....	6.10	1,695	.....	1,985	.....	705	3.67	460	.....	154	3.51	107
13.....	6.18	1,750	.....	1,930	.....	660	3.69	465	.....	158	3.50	108
14.....	6.22	1,775	.....	1,875	.....	610	3.66	455	.....	162	3.48	108
15.....	6.28	1,815	6.29	1,820	4.00	570	3.64	450	.....	166	3.48	109
16.....	6.30	1,830	6.24	1,790	4.00	570	3.61	435	.....	170	3.48	106
17.....	6.38	1,880	6.07	1,675	4.01	575	3.67	460	.....	174	3.48	105
18.....	6.40	1,895	5.96	1,605	3.97	560	3.65	450	.....	178	3.46	102
19.....	6.43	1,915	5.90	1,565	3.96	555	3.63	445	.....	182	3.46	100
20.....	6.50	1,960	5.86	1,540	3.94	550	3.61	435	.....	186	3.46	97
21.....	7.00	2,300	5.82	1,515	3.90	535	3.62	440	.....	190	3.46	95
22.....	7.70	2,785	5.80	1,500	3.89	535	3.63	445	.....	190	3.46	93
23.....	7.65	2,750	5.78	1,490	3.87	525	3.57	425	.....	198	3.44	90
24.....	7.62	2,725	5.74	1,465	3.89	535	3.57	425	.....	202	3.42	88
25.....	7.58	2,700	5.70	1,440	3.84	515	3.59	430	3.89	206	3.41	85
26.....	7.56	2,685	5.64	1,400	3.85	520	3.58	425	.....	198	3.41	82
27.....	7.40	2,570	5.61	1,380	3.84	515	3.59	430	.....	187	3.40	80
28.....	7.28	2,490	5.57	1,355	3.85	520	3.60	435	.....	176	3.39	78
29.....	7.20	2,435	.....	1,310	3.85	520	3.61	435	3.70	167	3.38	77
30.....	7.13	2,390	.....	1,265	3.86	520	3.62	440	3.70	165	3.37	73
31.....	7.00	2,300	.....	1,225	.....	.....	3.61	435	.....	.....	3.36 <sup>a</sup>	71

<sup>a</sup>—Ice conditions. Where no gauge heights are shown, discharge is estimated.<sup>b</sup> Backwater from North Saskatchewan River.

## MONTHLY DISCHARGE of Battle River at Battleford, for 1915.

(Drainage area 11,850 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	135	89	104	0.0088	0.01	6,395
February.....	90	64	72	0.0061	0.01	9,999
March.....	445	64	150	0.0127	0.01	9,233
April.....	2,355	290	1,330	0.1123	0.13	79,140
May.....	635	435	498	0.0420	0.05	30,621
June.....	1,585	500	947	0.0799	0.09	36,350
July.....	2,785	1,360	1,962	0.1656	0.19	120,639
August.....	2,295	1,225	1,788	0.1509	0.17	109,940
September.....	1,180	515	707	0.0597	0.07	43,069
October.....	620	425	459	0.0387	0.04	28,333
November.....	450	139	225	0.0190	0.02	13,398
December.....	150	71	102	0.0086	0.01	6,713
The year.....	.....	.....	.....	.....	0.80	506,209

## NORTH SASKATCHEWAN RIVER AT PRINCE ALBERT.

*Location.*—On river lot 76, Prince Albert settlement, at the Canadian Northern Railway and traffic bridge.

*Records available.*—October 2, 1911, to December 31, 1915.

*Gauge.*—Chain. Zero elevation has been maintained at 1,370.397 since establishment.

*Bench-mark.*—Brass bolt on top of right abutment of bridge, downstream side, marked "P.W.D. B.M.47." Elevation of bench-mark, 1,403.502 feet above mean sea level, determined by Canadian Geodetic Surveys.

*Channel.*—Partly boulders, partly sand. Not liable to very great changes.

*Discharge measurements.*—From bridge at gauge.

*Open water.*—April 10 to Nov. 7, 1915.

*Maximum flow.*—During flood of June–July, 1915, a maximum gauge height of 26.42 feet was reached, and a maximum discharge of 200,000 second-feet. This is a slightly greater height than was reached in August, 1899. Estimates of maximum discharge are supported by evidence from various sources, each sustaining the estimate to a probable accuracy within 5 per cent.

*Minimum flow.*—January 19, 1914, a flow of 850 sec.-feet was recorded.

*Observer.*—W. Moodie.

## DISCHARGE MEASUREMENTS of North Saskatchewan River at Prince Albert, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 2, 4, 5.....	F. R. Steinberger.....	544	1,447	1.01	3.92	1,460
Feb. 7.....	E. W. W. Hughes.....	530	1,486	1.21	4.19	1,796
Feb. 10.....	do.....	530	1,390	1.23	4.19	1,712
Feb. 26.....	do.....	517	1,438	1.12	4.26	1,614
Mar. 12.....	do.....	512	1,439	1.09	4.29	1,570
Mar. 15.....	do.....	527	1,461	1.09	4.26	1,588
April 2.....	do.....	544	1,917	1.28	4.73	2,462
April 30 and May 1....	do.....	759	3,348	1.56	4.67	5,224
June 8.....	F. K. Beach.....	846	6,303	3.04	8.36	19,169
July 1.....	G. H. Whyte..... <i>a</i>	908	19,500	8.37	22.45	163,303
July 2.....	do..... <i>b</i>	935	23,792	7.81	26.35	185,794
July 3.....	do..... <i>c</i>	906	18,100	5.95	20.95	107,742
July 5.....	F. K. Beach..... <i>d</i>	886	12,312	4.78	14.49	58,834
Aug. 16.....	do.....	857	7,664	3.29	9.68	25,141
Sept. 13.....	do.....	828	5,864	2.65	7.63	15,538
Oct. 9.....	do.....	757	4,278	1.86	5.65	7,969
Nov. 4, 5.....	F. R. Steinberger.....	745	3,574	1.64	4.84	5,871
Nov. 20, 22, 23.....	do.....	685	4,151	0.63	5.41	2,618
Dec. 9, 10.....	do.....	665	3,336	0.72	4.96	2,402

*a, b, c, d.* Velocities observed at depth of 1 foot, affected by coefficient to obtain mean velocity, and applied to soundings obtained after flood subsided.

*a, c* Coefficient to obtain mean velocity—0.92.

*b* Coefficient to obtain mean velocity—1.20. High on account of debris on piers.

*d* Coefficient to obtain mean velocity—0.94.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Prince Albert, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.72 <sup>b</sup>	1,280	4.15	1,600	4.30	1,630	4.57	2,250	4.72	5,480	6.22	9,940
2.....	3.82	1,340	4.10	1,650	4.31	1,660	4.73	2,500	4.63	5,260	6.46	10,310
3.....	3.90	1,400	4.10	1,690	4.32	1,660	4.99	3,200	4.69	5,410	6.64	11,510
4.....	3.92	1,440	4.10	1,710	4.32	1,670	5.20	3,900	4.74	5,530	6.98	12,870
5.....	3.99	1,450	4.15	1,750	4.30	1,610	5.97	6,030	4.67	5,360	7.15	13,580
6.....	4.08	1,540	4.19	1,780	4.25	1,580	6.85	9,220	4.65	5,310	7.02	13,030
7.....	4.10	1,700	4.18	1,800	4.27	1,570	7.01	10,500	4.60	5,190	7.16	13,620
8.....	4.10	1,800	4.21	1,770	4.27	1,570	8.05	15,500	4.60	5,190	8.2 <sup>c</sup>	18,470
9.....	4.20	1,900	4.21	1,750	4.27	1,580	8.62	18,500	4.58	5,140	9.65	25,110
10.....	4.30	2,000	4.19	1,710	4.28	1,580	8.21 <sup>b</sup>	18,240	4.49	4,930	11.10	33,860
11.....	4.30	2,100	4.19	1,700	4.30	1,580	6.93	12,870	4.48	4,910	10.86	32,300
12.....	4.35	2,150	4.19	1,700	4.29	1,570	7.18	13,710	4.44	4,820	9.97	26,840
13.....	4.31	2,100	4.19	1,690	4.29	1,580	7.60	15,500	4.48	4,910	9.52	23,410
14.....	4.25	2,050	4.19	1,660	4.25	1,580	7.42	14,710	4.58	5,140	9.16	22,630
15.....	4.35	2,050	4.19	1,650	4.26	1,590	6.80	12,150	4.70	5,430	10.23	28,380
16.....	4.25	2,050	4.18	1,630	4.26	1,590	6.68	11,670	5.01	5,180	12.38	42,660
17.....	4.25	2,030	4.15	1,570	4.26	1,600	6.44	10,730	5.26	6,880	11.74	38,180
18.....	4.30	2,000	4.15	1,560	4.26	1,600	6.16	9,730	5.36	7,160	11.14	34,120
19.....	4.22	1,970	4.18	1,570	4.25	1,630	5.90	8,830	5.60	7,870	10.63	30,830
20.....	4.25	1,950	4.18	1,560	4.32	1,700	5.74	8,320	5.79	8,480	10.38	29,280
21.....	4.20	1,880	4.18	1,550	4.35	1,780	5.55	7,710	5.92	8,890	10.14	27,840
22.....	4.15	1,800	4.23	1,600	4.35	1,790	5.34	7,100	5.90	8,830	9.98	26,890
23.....	4.20	1,750	4.26	1,610	4.35	1,800	5.24	6,820	5.73	8,290	9.79	25,870
24.....	4.21	1,700	4.26	1,610	4.30	1,750	5.15	6,570	5.81	8,540	10.17	28,020
25.....	4.10	1,690	4.26	1,610	4.35	1,770	5.06	6,320	6.14	9,650	10.90	32,560
26.....	4.10	1,640	4.26	1,610	4.42	1,850	4.97	6,080	6.43	10,700	10.66	31,020
27.....	4.10	1,600	4.30	1,620	4.48	1,950	4.94	6,010	6.39	10,550	10.19	28,140
28.....	4.10	1,550	4.30	1,620	4.51	2,050	4.78	5,620	6.24	10,010	9.84	26,140
29.....	4.05	1,520	.....	.....	4.45	2,000	4.78	5,620	6.15	9,690	9.68	25,270
30.....	4.14	1,550	.....	.....	4.45	2,000	4.80	5,670	6.02	9,220	9.84 <sup>d</sup>	27,508
31.....	4.25	1,590	.....	.....	4.45	2,050	.....	.....	6.00	9,150	.....	.....

<sup>a</sup> Mean gauge height and discharge from hourly records.<sup>b</sup> to <sup>b</sup> Open water.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Prince Albert, for 1915.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1. ....	20.40a	139,945	11.49	36,430	9.53	24,460	6.01	9,190	4.94	6,010	5.25	2,720
2. ....	25.98a	186,546	11.22	34,650	9.37	23,660	5.94	8,960	4.90	5,910	5.31	2,800
3. ....	20.66a	107,171	10.92	32,690	9.17	22,680	5.92	8,890	4.88	5,860	5.40	2,850
4. ....	15.31a	64,000	10.62	30,770	8.92	21,480	5.92	8,890	4.86	5,810	5.43	2,880
5. ....	14.51a	58,991	10.74	31,540	8.68	20,380	5.91	8,860	4.82	5,720	5.32	2,810
6. ....	14.43	58,610	10.81	31,980	8.56	19,830	5.84	8,640	4.76	5,570	5.22	2,730
7. ....	14.22	56,850	10.74	31,540	8.46	19,370	5.76	8,380	4.76	5,570	5.14	2,640
8. ....	13.54	51,320	10.79	31,860	8.46	19,370	5.69	8,160	4.46b	4,950	5.06	2,560
9. ....	12.87	46,240	10.71	31,340	8.42	19,190	5.71	8,220	4.40	4,750	5.01	2,480
10. ....	12.41	42,870	10.60	30,640	8.12	17,840	5.58	7,810	4.40	4,230	4.90	2,400
11. ....	12.12	40,840	10.72	31,410	7.90	16,850	5.66	8,060	4.48	4,100	4.84	2,400
12. ....	12.12	40,840	10.60	30,640	7.78	16,310	5.76	8,380	.....c	4,000	4.85	2,390
13. ....	12.16	41,120	10.14	27,840	7.67	15,820	5.86	8,700	.....	3,850	4.85	2,380
14. ....	12.18	41,260	9.89	26,410	7.60	15,500	5.92	8,890	.....	3,710	4.80	2,370
15. ....	11.94	39,580	9.78	25,810	7.53	15,190	5.82	8,570	.....	3,600	4.77	2,330
16. ....	11.75	38,250	9.74	25,600	7.34	14,380	5.71	8,220	.....	3,480	4.75	2,280
17. ....	11.63	37,410	9.60	24,840	7.10	13,370	5.59	7,840	.....	3,330	4.68	2,200
18. ....	11.38	35,710	9.48	24,200	6.90	12,550	5.48	7,490	.....	3,200	4.58	2,090
19. ....	11.00	33,200	9.30	23,320	6.77	12,030	5.37	7,190	.....c	3,100	4.47	1,930
20. ....	15.63	69,450	9.18	22,730	6.63	11,470	5.36	7,160	5.17	2,990	4.40	1,780
21. ....	16.88	81,950	9.10	22,340	6.44	10,730	5.35	7,130	5.41	2,860	4.40	1,790
22. ....	16.49	77,900	9.01	21,900	6.32	10,300	5.26	6,880	5.53	2,750	4.47	1,880
23. ....	16.00	73,000	9.00	21,850	6.21	9,910	5.24	6,820	5.65	2,620	4.55	1,980
24. ....	15.32	66,180	9.00	21,850	6.22	9,940	5.19	6,680	5.57	2,650	4.55	1,990
25. ....	14.55	59,640	9.14	22,540	6.21	9,910	5.08	6,370	5.49	2,680	4.49	1,910
26. ....	13.94	54,520	9.44	24,010	6.18	9,800	5.05	6,290	5.41	2,700	4.43	1,880
27. ....	13.44	50,500	10.56	30,380	6.08	9,440	5.01	6,180	5.39	2,720	4.43	1,860
28. ....	12.95	46,830	11.34	35,440	6.00	9,150	4.95	6,030	5.38	2,730	4.38	1,820
29. ....	12.66	44,680	10.78	31,790	6.09	9,470	4.98	6,100	5.35	2,720	4.28	1,800
30. ....	12.34	42,380	10.14	27,840	6.12	9,580	4.98	6,100	5.30	2,720	4.25	1,750
31. ....	11.88	39,160	9.78	25,810	.....	.....	5.00	6,150	.....	.....	4.19	1,700b

a Mean gauge height and discharge from hourly records. Maximum gauge height, July 2, 26.42; maximum discharge, 200,000.

b to b Ice conditions.

c to c Discharge interpolated.

## MONTHLY DISCHARGE of North Saskatchewan River at Prince Albert, for 1915.

(Drainage area 59,900a square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	2,150	1,280	1,760	0.0294	0.03	108,219
February.....	1,800	1,550	1,655	0.0276	0.03	91,914
March.....	2,050	1,570	1,707	0.0285	0.03	104,960
April.....	18,500	2,250	9,046	0.1510	0.17	538,274
May.....	10,700	4,820	7,003	0.1169	0.13	430,597
June.....	42,660	9,940	25,023	0.4177	0.47	488,972
July.....	186,546	33,200	60,224	1.0054	1.16	3,703,029
August.....	36,430	21,850	28,129	0.4696	0.54	1,729,585
September.....	24,460	9,150	14,999	0.2504	0.28	892,503
October.....	9,190	6,030	7,653	0.1278	0.15	470,564
November.....	6,010	2,620	3,896	0.0650	0.07	231,828
December.....	2,880	1,700	2,238	0.0374	0.04	137,609
The year.....	.....	.....	.....	.....	3.10	8,928,054

a The drainage area in this table is only approximate.

It must be remembered that the greater part of the run-off at this station is derived from the eastern slope of the Rocky Mountains, and must not be used to base estimates of run-off on other streams in this vicinity.

## SESSIONAL PAPER No. 25c

## LITTLE RED RIVER NEAR PRINCE ALBERT.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 26, Tp. 49, Rge. 26, W. 2nd Mer.

*Records available.*—July 14, 1915, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation has been maintained at an elevation of 89.62 feet since establishment.

*Bench-mark.*—Spike in top of 8 inch poplar stump 100 feet upstream from gauge on right bank. Elevation assumed, 100.00 feet.

*Channel.*—Shifting silt; gauge height affected by logs lying in or being driven down river.

*Discharge measurements.*—Made with meter at or near gauge by wading, or from bridge one mile downstream.

*Fluctuations in flow.*—Caused by artificial regulation of lake outlets.

*Winter flow.*—Discharge measurements have been made, but no gauge height observations taken.

*Observer.*—Mrs. A. Charnbury.

## DISCHARGE MEASUREMENTS of Little Red River near Prince Albert, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 14.....	F. K. Beach.....	48.0	77.0	1.20	2.60	92.0
Aug. 17.....	do.....	32.0	22.0	0.48	1.05	9.6
Sept. 11.....	do.....	47.4	97.0	0.94	2.88	90.0
Oct. 8.....	do.....	40.5	55.0	1.50	1.32	82.0
Nov. 5.....	F. R. Steinberger.....	25.5	18.5	0.69	0.02	12.8
Nov. 23.....	do.....	25.0	10.0	0.74	0.26	7.4
Dec. 10.....	do.....	12.0	6.9	0.53	0.06	3.7

## DAILY GAUGE HEIGHT AND DISCHARGE of Little Red River near Prince Albert, for 1915.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.52	88.0	3.34	117.0	2.24	142.0
2.....			2.46	83.0	2.05	47.0	2.32	147.0
3.....			1.89	54.0	2.56	73.0	1.94	121.0
4.....			1.86	51.0	1.88	39.0	1.62	101.0
5.....			1.70	44.0	1.37	18.8	2.31	147.0
6.....			1.58	38.0	1.10	10.8	2.30	146.0
7.....			1.46	32.0	1.01	8.6	1.62	101.0
8.....			1.40	29.0	1.12	11.4	1.52	94.0
9.....			1.32	25.0	2.68	79.0	1.88	118.0
10.....			1.32	25.0	2.90	91.0	1.45	90.0
11.....				23.06	2.88	90.0	1.80	112.0
12.....				21.0	3.15	106.0	1.26	79.0
13.....				19.0	3.10	103.0	1.16	72.0
14.....	2.32	77 <sup>c</sup>		17.0	2.58	74.0	1.12	69.0
15.....	2.62	93		15.0	3.11	104.0	1.06	66.0
16.....	1.99	60		12.06	2.95	94.0	1.09	67.0
17.....	1.77	49	1.06	9.8	2.82	87.0	1.06	66.0
18.....	2.24	73	1.05	9.6	2.18	61.0 <sup>d</sup>	0.16	20.0
19.....	3.21	130	1.06	9.8	2.59	102.0	0.14	19.8
20.....	3.24	131	1.06	9.8	2.51	113.0	0.14	19.8
21.....	3.13	125	1.03	9.1	2.50	125.0	0.14	19.8
22.....	2.18	70	1.06	9.8	2.50	142.0	0.13	19.4
23.....	1.75 <sup>a</sup>	48	1.02	8.9	3.17	213.0 <sup>d</sup>	0.14	19.8
24.....	1.32	29	0.83	4.4	3.00	199.0	0.14	19.8
25.....	2.27	74	0.82	4.2	2.54	164.0	0.14	19.8
26.....	2.06	63	0.77	3.1	2.52	162.0	0.14	19.8
27.....	3.86	168	0.76	2.9	2.47	159.0	0.12	19.1
28.....	2.18	70	0.74	2.4	2.20	139.0	0.11	18.7
29.....	2.30	76	0.72	2.0	2.20	139.0	0.12	19.1
30.....	2.04	62	2.20	54.0	2.20	139.0	0.12	19.1
31.....	2.72	97	1.45	22.0			0.11	18.7

*a* Gauge height interpolated.

*b-b* Discharge interpolated.

*c-c* Shifting conditions.

*d-d* Shifting conditions, logs running.

## MONTHLY DISCHARGE of Little Red River near Prince Albert, for 1915.

(Drainage area 520 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
July (14-31).....	168	29.0	83	0.160	0.11	2,963
August.....	88	2.0	24	0.046	0.05	1,476
September.....	213	8.6	100	0.192	0.21	5,950
October.....	147	18.7	65	0.125	0.14	3,997
The period.....					0.51	14,386

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in North Saskatchewan River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
July 13.....	O. H. Hoover..... <sup>a</sup>	Baptiste River.....	Near mouth of river		219.60	3.16	695.00
Aug. 30.....		Blackstone Creek.....	SW. 12-42-19-5.....	19.8	18.00	1.33	24.00
Sept. 7.....		Brazeau Creek.....	Outlet stream from Brazeau Lake in Tp. 39-22-55.....	50.0	90.60	4.68	424.00
Jan. 15.....	H. B. R. Thompson	Brazeau River.....	Above junction with Nordegg River.....	212.0	208.00	1.31	274.00
Jan. 16.....	do	do	do	212.0	208.00	1.27	267.00
Mar. 3.....	do	do	do	206.0	90.20	2.77	250.00
Mar. 4.....	do	do	do	206.0	90.20	2.76	250.00
Sept. 2.....	O. H. Hoover..... <sup>a</sup>	do	Below mouth of Nordegg River.....		1717.50	1.93	3331.00
Sept. 7.....		do	Above Brazeau Lake outlet in Tp. 39-22-5.....	47.0	86.30	1.63	141.00
Aug. 23.....	do	Brazeau River (So.)	Tp. 44-15-5.....	193.5	363.00	1.69	613.00
Jan. 9.....	H. B. R. Thompson	Buck Creek.....	Near Buck Lake, in Tp. 47-6-5.....	39.0	23.70	0.64	15.30
Jan. 23.....	do	do	do	39.5	25.30	0.59	14.90
Mar. 7.....	do	do	do	43.0	21.10	0.72	15.20
Mar. 10.....	do	do	do	44.0	20.80	0.74	15.40
July 24.....	O. H. Hoover.....	do	do	27.4	35.60	5.81	207.00
Sept. 13.....		do	do	22.5	37.40	5.86	219.00
Sept. 13.....	do	Cline River.....	Tp. 37-25-5.....	29.5	36.50	2.08	76.00
Sept. 14.....	do	Coral Creek.....	Tp. 37-19-5.....	31.0	22.90	2.88	66.00
Sept. 13.....	do	Corral Creek.....	Tp. 37-25-5.....	29.0	40.80	2.48	101.00
June 7.....	do	Creek.....	Tp. 40-15-5.....	5.0	1.94	0.99	1.90
June 7.....	do	do	Tp. 39-14-5.....	7.0	4.70	1.75	8.20
June 7.....	do	do	Tp. 39-15-5.....	5.9	2.57	0.76	1.96
June 16.....	do	do	Tp. 38-17-5.....	17.0	12.00	3.58	43.00
July 3.....	do	do	Tp. 35-19-5.....	14.2	8.36	2.75	23.00
July 10.....	do	do	Tp. 38-17-5.....	28.3	18.10	3.72	67.00
July 10.....	do	do	Tp. 38-17-5.....	16.5	8.05	3.58	29.00
July 17.....	do	do	Tp. 40-15-5.....	12.1	7.38	2.57	19.00
July 17.....	do	do	Tp. 39-14-5.....	16.7	12.00	3.42	41.00
July 19.....	do	do	Tp. 40-13-5.....	8.0	8.95	2.27	20.00
July 19.....	do	do	Tp. 40-13-5.....	15.7	12.00	2.76	33.00
Aug. 24.....	do	do	Tributary South Brazeau River, in Tp. 44-15-5.....	17.0	22.10	0.73	16.10
Aug. 29.....	do	do	Tributary South Brazeau River, in Tp. 42-17-5.....	10.3	4.10	0.76	3.10
Sept. 2.....	do	do	Tp. 43-20-5.....	15.5	9.98	2.31	23.00
Sept. 11.....	do	do	Tributary Brazeau River, in Tp. 38-22-5.....	14.5	7.20	1.29	9.30
Sept. 11.....	do	do	Tributary Brazeau River, in Tp. 38-22-5.....	42.0	59.80	0.90	54.00
Sept. 11.....	do	do	Tributary Brazeau River, in Tp. 38-22-5.....	11.4	12.30	1.27	15.60

<sup>a</sup> Measurement made by Department of Public Works while surveying reservoir sites in the vicinity.<sup>b</sup> Approximate location.

## SESSIONAL PAPER No. 25c

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in North Saskatchewan River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq.-ft.	Ft. per sec.	Sec.-ft.
Oct. 15....	O. H. Hoover.....	Creek .....	Emptying into Mistaya River below Water Fowl Lakes, in Tp. 33-19-5..... <sup>b</sup>	9.5	7.75	1.50	11.60
Aug. 30....	do .....	George River.....	NW. 1-42-19-5.....	25.0	17.00	2.13	36.00
July 1....	do .....	Glacier Creek.....	Tp. 34-21-5..... <sup>b</sup>	36.0	107.00	5.23	560.00
Oct. 20....	..... <sup>a</sup>	do .....	Outlet of Lake..... <sup>b</sup>	.....	39.80	1.20	48.00
June 24....	do .....	Goat Creek.....	Tp. 35-18-5..... <sup>b</sup>	13.0	11.60	2.67	31.00
June 14....	do .....	Haven Creek.....	Tp. 39-14-5..... <sup>b</sup>	21.0	24.90	3.49	87.00
July 12....	do .....	do .....	do .....	43.5	44.10	2.79	123.00
June 28....	do .....	Howse Creek.....	Tp. 33-21-5..... <sup>b</sup>	38.0	47.20	4.75	224.00
Sept. 4....	do .....	Isaac Creek.....	Tp. 41-21-5..... <sup>b</sup>	32.0	28.40	3.03	86.00
Feb. 11....	E. W. W. Hughes.....	Little Red Deer River.....	Near Prince Albert	22.0	11.40	0.42	4.80
Feb. 27....	do .....	do .....	do .....	18.0	10.45	0.27	2.90
Mar. 16....	do .....	do .....	do .....	18.7	10.80	0.42	4.50
Mar. 18....	do .....	do .....	do .....	18.7	10.78	0.42	4.50
April 1....	do .....	do .....	do .....	16.7	15.38	0.60	9.25
May 5....	O. H. Hoover.....	Martin Creek.....	SE. 27-40-15-5...	2.8	0.37	0.76	0.28
June 11....	do .....	do .....	do .....	7.2	6.52	1.02	6.60
Oct. 12....	do .....	Mistaya River.....	At Peyto Lake, in Tp. 32-18-5..... <sup>b</sup>	9.5	9.45	2.12	20.00
Oct. 14....	do .....	do .....	Above Lower Lake, in Tp. 33-19-5..... <sup>b</sup>	31.0	28.40	2.39	68.00
Oct. 16....	do .....	do .....	Above Silverhorn Creek, in Tp. 33-19-5..... <sup>b</sup>	37.0	43.30	1.20	52.00
Oct. 16....	do .....	do .....	Below Lower Lake, in Tp. 33-19-5..... <sup>b</sup>	17.5	22.10	3.03	67.00
Aug. 21....	do .....	Mud Creek.....	Tp. 42-16-5..... <sup>b</sup>	17.6	16.40	1.22	20.00
Jan. 15....	do .....	Nordeg River.....	At junction of Brazeau River.....	62.0	54.60	0.38	21.00
Jan. 16....	do .....	do .....	do .....	62.0	54.60	0.41	23.00
Mar. 3....	H. B. R. Thompson	do .....	do .....	53.0	17.20	1.20	21.00
Mar. 4....	do .....	do .....	do .....	53.0	17.20	1.28	22.00
Sept. 2....	..... <sup>a</sup>	do .....	Near mouth of River.....	.....	126.80	1.38	175.00
Jan. 13....	do .....	North Saskatchewan River.....	Above junction of Brazeau River.....	330.0	565.00	1.55	876.00
Jan. 14....	do .....	do .....	do .....	330.0	565.00	1.55	880.00
Feb. 9....	E. W. W. Hughes...	do .....	La Colle Falls.....	597.0	1758.00	1.06	1,863.00
Mar. 1....	H. B. R. Thompson	do .....	Above junction with Brazeau River.....	315.0	418.00	1.77	744.00
Mar. 2....	do .....	do .....	do .....	315.0	418.00	1.78	745.00
Mar. 14....	E. W. W. Hughes...	do .....	La Colle Falls.....	585.0	1574.00	1.06	1,662.00
Mar. 14....	do .....	do .....	do .....	585.0	1575.00	1.06	1,662.00
June 6....	O. H. Hoover.....	do .....	At Brazeau Gap.....	199.0	936.60	4.39	4,111.00
June 28....	do .....	do .....	Above Howse Creek, in Tp. 33-21-5..... <sup>b</sup>	..... <sup>c</sup>	170.40	..... <sup>c</sup>	1,173.00
Oct. 19....	do .....	do .....	Above West Branch in Tp. 34-20-5..... <sup>b</sup>	103.0	116.00	1.39	161.00
Oct. 19....	do .....	N. Saskatchewan River (N. Bch.)..	Tp. 34-20-5..... <sup>b</sup>	110.0	101.00	2.91	294.00
Sept. 3....	do .....	Opabin Creek.....	Tp. 42-20-5..... <sup>b</sup>	23.0	15.20	1.71	26.00
Oct. 16....	do .....	Silverhorn Creek.....	Tp. 33-19-5..... <sup>b</sup>	17.0	5.45	1.10	6.00
Aug. 30....	do .....	Smith Creek.....	SW. 7-42-18-5.....	12.5	5.15	0.93	4.80
June 7....	do .....	Sulphur Spring.....	Tp. 40-15-5..... <sup>b</sup>	2.1	0.35	0.49	0.17
Oct. 7....	do .....	Wilson Creek.....	Tp. 35-20-5..... <sup>b</sup>	8.5	6.70	1.61	10.80

<sup>a</sup> Measurement made by Department of Public Works while surveying reservoir sites in the vicinity.<sup>b</sup> Approximate location.<sup>c</sup> Not compiled, as stream comprises three channels.



## RED DEER RIVER DRAINAGE BASIN.

*General Description.*

The Red Deer River rises in the Sawback Range of the Rockies in the northern portion of the Rocky Mountain Park, near the boundary between the provinces of Alberta and British Columbia. It flows eastward for about forty miles, then northeastward for seventy or eighty miles to a point near Red Deer, Alberta. From here the river flows in a southeasterly and easterly direction to its junction with the South Saskatchewan River, just east of the 4th Mer., in Tp. 22, Rge. 28, W. 3rd Mer. It has a length of approximately 400 miles.

The valley of the Red Deer is wide and deep, the banks being rough and cut up with a large number of deep coulees, draining into the river. Near the source the basin is well timbered, and a good growth of timber is found along its banks for some distance out into the prairie. Seams of coal, well suited for domestic use, are found in the valley and form the principal source of fuel supply for the settlers along the stream in the prairie section.

The river carries a considerable supply of water at all times of the year, but the volume is subject to sudden variations, due to the melting of snow in the mountains and heavy summer rains.

Of the tributaries of the Red Deer, the most important are, the Panther River near its head, Little Red Deer and Medicine Rivers, entering in Tp. 36, Rge. 1, W. 5th Mer., and Rosebud River emptying into it in Tp. 28, Rge. 19, W. 4th Mer. In addition, there are numerous small streams draining into the main river in the western portion of the basin. From the mouth of the Rosebud River eastward there is very little drainage into the river.

Very little water is taken from the Red Deer and its branches for irrigation purposes. There are only a few small schemes on some of the smaller tributaries. The land along the valley, though lacking moisture, is extremely fertile, and with the help of irrigation much of it might be cultivated and fine crops produced. The irrigation of the bench land from the river would be difficult on account of the small fall in the river, the depth of the valley, and the rolling nature of the lands in the drainage basin.

Very little hydrometric work has been done in this basin as yet. A gauging station was established on the Red Deer River near Innisfail, in 1910, but an observer could not be secured and only periodic discharge measurements have been secured at this station. In December 1911, another gauging station was established at the town of Red Deer, and continuous records have been obtained since then.

Of the tributaries of Red Deer River, Berry and Blood Indian Creeks are the only ones that have been given any attention. These small creeks, which drain into the river in the prairie section, have a few small irrigation rights registered against them. Gauging stations were established on them in 1911, but owing to the high cost of obtaining data they were abandoned in 1913.

A special report upon the floods in this drainage basin is given in Appendix No. 4 of this report.

## RED DEER RIVER AT RED DEER.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 20, Tp. 38, Rge. 27, W. 4th Mer., at the steel traffic bridge in the town of Red Deer.

*Records available.*—January 1, 1912, to December 31, 1915.

*Gauge.*—Chain. Length of chain from bottom of weight to marker is 29.52 feet. Zero elevation of gauge maintained at 84.40 feet since establishment.

*Bench-mark.*—Marked with white paint on northwest face of north abutment. Assumed elevation, 100.00 feet.

*Channel.*—Slightly shifting.

*Discharge measurements.*—Made from bridge.

*Winter flow.*—From November to April river is frozen over and measurements are made at a point about one-half mile below the bridge.

*Floods.*—This stream was in flood June 26 to July 22, reaching a maximum gauge height of 19.05 feet at 9.20 p.m. on June 27. Maximum discharge, 68,000 sec.-feet. On July 18, it again rose to a gauge height of 15.83.

*Observer.*—C. H. Snell.



North Saskatchewan River in flood at Edmonton, on June 28, 1915. General view looking west from left bank. Taken a few hours before the maximum height was reached.  
Taken by I. R. Strome.



Red Deer River in flood at Red Deer, on June 27, 1915. Looking upstream at Canadian Pacific Railway Company's bridge, about time of maximum stage.  
Taken by Inspector Lindsay, R. N. W. M. P.



## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Red Deer River at Red Deer, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 12	H. S. Kerby	250	279	1.01	3.84	283
Feb. 13	H. W. Rowley	240	274	1.02	4.12	280
Feb. 23	do	250	268	1.02	4.14	275
April 13	I. R. Strome	233	543	1.85	3.71	980
April 30	do	235	552	1.88	3.83	1,038
May 18	do	357	1,443	4.37	6.85	6,299
June 12	do	376	1,605	4.45	7.05	7,144
June 28	H. M. Nelson	420	5,668	10.00	17.39	56,454
June 29	do	420	3,798	7.81	12.86	29,660
June 30	do	420	3,135	6.77	11.52	21,231
July 1	do	418	2,886	6.06	10.60	17,456
July 10	I. R. Strome	383	2,119	3.39	7.59	7,177
July 30	do	418	3,471	5.60	10.54	19,481
Sept. 2	do	364	1,542	2.97	6.29	4,581
Sept. 22	do	352	1,331	2.72	5.77	3,618
Oct. 9	do	354	1,318	2.56	5.62	3,370
Oct. 25	do	281	1,057	2.19	5.09	2,315
Dec. 1	F. K. Beach	310	531	1.07	5.85	570
Dec. 30	do	300	325	1.43	5.83	466

## DAILY GAUGE HEIGHT AND DISCHARGE of Red Deer River at Red Deer, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3.88a	330	3.99	265	4.16	285	4.31	1,674	3.90	1,175	6.06	4,692
2	3.88	325	4.03	270	4.17	285	4.38	1,772	4.17	1,494	6.35	5,330
3	3.86	320	4.06	270	4.17	290	4.37	1,758	4.18	1,506	7.89	9,270
4	3.85	310	4.07	280	4.16	290	4.44	1,856	4.43	1,842	8.40	10,800
5	3.86	305	4.07	280	4.15	290	4.40	1,800	4.78	2,350	7.90	9,300
6	3.85	300	4.09	265	4.15	290	4.45	1,870	4.98	2,668	7.72	8,760
7	3.85	290	4.09	265	4.15	295	4.36	1,744	5.04	2,768	7.43	7,965
8	3.79	285	4.09	270	4.15	300	4.24	1,582	5.34	3,282	7.41	7,915
9	3.76	270	4.10	270	4.14	300	4.08	1,386	5.81	4,170	7.41	7,915
10	3.75	265	4.09	270	4.15	310	3.98	1,266	5.61	3,784	7.08	7,090
11	3.80	270	4.11	270	4.13	320	3.85	1,120	5.39	3,372	6.98	6,840
12	3.84	285	4.12	275	4.05	325	3.79	1,054	5.06	2,802	7.06	7,040
13	3.87	300	4.12	280	4.09	330	3.75	1,010	4.84	2,444	7.15	7,265
14	3.87	300	4.10	280	4.12	340	3.76	1,021	5.01	2,717	7.29	7,615
15	3.90	280	4.04	275	4.11	345	3.74	1,001	6.47	5,608	7.37	7,815
16	3.89	260	4.10	270	4.08	355	3.70	965	6.99	6,865	7.27	7,565
17	3.88	270	4.10	260	4.10	375	3.67	938	6.94	6,740	7.28	7,590
18	3.87	280	4.11	260	4.20	410	3.65	920	6.91	6,665	7.67	8,616
19	3.86	300	4.11	260	4.73	450	3.66	929	6.67	6,088	7.72	8,760
20	3.91	285	4.13	265	4.87	530	3.65	920	6.44	5,536	7.60	8,420
21	3.95	275	4.15	270	5.49	600	3.75	1,010	6.20	5,198	7.45	8,015
22	3.97	270	4.16	270	5.44	680	3.77	1,032	6.32	5,264	7.27	7,565
23	3.96	260	4.17	275	5.27	770	3.66	929	6.36	5,352	7.07	7,065
24	3.99	255	4.12	275	5.60	870	3.66	929	6.39	5,418	7.02	6,940
25	3.96	245	4.13	270	5.75	1,000	3.82	1,087	6.70	6,160	7.39	7,865
26	3.98	240	4.14	275	5.64	1,120	3.95	1,230	7.06	7,040	9.36	13,810
27	3.99	240	4.15	275	5.35	1,220	3.98	1,266	6.99	6,865	17.30	56,440
28	4.01	245	4.15	280	5.07	1,320	3.95	1,230	6.67	6,088	16.80	52,580
29	4.01	250			4.85	1,430	3.85	1,120	6.51	5,794	13.75	30,775
30	3.97	250			4.63	1,500	3.84	1,109	6.62	5,968	11.50	22,675
31	3.97	200			4.20a	1,560			6.31	5,242		

a to a Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Red Deer River at Red Deer, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	10.73	18,585	9.45	13,388	6.34	4,570	5.56	3,186	4.93	2,222	5.90	570
2.....	10.28	16,640	9.10	12,150	6.29	4,471	5.66	3,347	4.89	2,166	5.89	585
3.....	9.56	13,800	8.58	10,390	6.61	5,116	5.86	3,687	4.81	2,054	6.32	600
4.....	8.92	11,520	8.21	9,280	6.43	4,750	6.15	4,205	4.75	1,975	6.41	610
5.....	8.41	9,880	7.90	8,350	6.27	4,433	6.17	4,243	4.69	1,897	6.48	615
6.....	8.21	9,280	7.58	7,448	6.16	4,224	6.05	4,025	4.68	1,884	6.48	610
7.....	8.05	8,800	7.37	6,881	6.09	4,097	5.89	3,738	4.44	1,588	6.38	595
8.....	8.03	8,740	7.26	6,625	6.19	4,281	5.73	3,466	4.50	1,660	6.39	570
9.....	7.85	8,200	7.05	6,120	6.18	4,262	5.64	3,314	4.50	1,660	6.40	550
10.....	7.61	7,528	6.93	5,832	6.21	4,319	5.56	3,186	4.24	1,354	6.19	520
11.....	7.45	7,110	6.80	5,530	6.17	4,243	5.51	3,106	5.02	1,320	6.02	500
12.....	7.18	6,432	6.64	5,179	6.04	4,007	5.48	3,058	6.61	1,260 <sup>a</sup>	5.98	495
13.....	7.03	6,072	6.54	4,970	5.93	3,809	5.43	2,978	6.86 <sup>b</sup>	1,220	5.70	490
14.....	8.09	8,920	6.52	4,930	5.87	3,704	5.37	2,882	7.11 <sup>b</sup>	1,170	5.83	485
15.....	13.20	30,500	6.43	4,750	5.84	3,653	5.33	2,818	7.36 <sup>b</sup>	1,120	5.93	480
16.....	12.98	29,400	6.32	4,530	5.89	3,738	5.28	2,740	7.52	1,080	5.95	480
17.....	13.51	32,205	6.36	4,610	5.87	3,704	5.25	2,695	7.65	1,040	5.99	490
18.....	15.83	46,200	6.30	4,490	5.83	3,636	5.21	2,635	7.51	1,000	6.07	490
19.....	14.78	37,580	6.68	5,266	5.81	3,602	5.20	2,620	7.06	930	5.97	500
20.....	12.84	28,700	8.98	11,730	5.89	3,738	5.21	2,635	6.89	860	6.03	510
21.....	11.65	22,788	13.25	30,775	5.89	3,738	5.19	2,605	6.77	810	6.04	520
22.....	10.69	18,405	10.24	16,470	5.77	3,534	5.21	2,635	6.56	740	5.95	510
23.....	10.19	16,260	8.98	11,730	5.73	3,466	5.20	2,620	6.85	690	5.99	510
24.....	9.87	14,980	8.12	9,010	5.85	3,670	5.14	2,530	6.63	650	6.00	500
25.....	9.49	13,538	7.65	7,638	6.09	4,097	5.08	2,440	6.40	615	6.01	490
26.....	9.21	12,535	7.32	6,775	5.99	3,917	5.02	2,350	6.44	590	6.00	485
27.....	8.82	11,170	7.08	6,192	5.85	3,670	4.98	2,292	6.38	580	6.01	475
28.....	8.50	10,150	6.86	5,664	5.75	3,500	4.96	2,264	6.26	570	5.97	470
29.....	10.76	18,720	6.68	5,266	5.69	3,398	4.94	2,236	5.90	570	5.93	470
30.....	10.69	18,405	6.54	4,970	5.61	3,266	4.92	2,208	6.05	565	5.83	465
31.....	10.16	16,140	6.42	4,730	.....	.....	4.93	2,222	.....	.....	5.74	470 <sup>a</sup>

a to a Ice conditions.

b Gauge height interpolated.

## MONTHLY DISCHARGE of Red Deer River at Red Deer, for 1915.

(Drainage area 4,500 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	330	240	278	0.062	0.07	17,094
February.....	250	260	271	0.060	0.06	15,051
March.....	1,560	285	606	0.135	0.16	37,261
April.....	1,870	920	1,251	0.278	0.31	74,440
May.....	7,040	1,175	4,457	0.990	1.14	274,050
June.....	56,000	4,692	12,308	2.740	3.06	732,377
July.....	46,200	6,072	16,748	3.720	4.29	1,029,795
August.....	30,775	4,490	8,118	1.800	2.08	499,157
September.....	5,116	3,266	3,954	0.879	0.98	235,279
October.....	4,243	2,208	2,934	0.652	0.75	180,405
November.....	2,222	565	1,195	0.266	0.30	71,107
December.....	615	465	520	0.116	0.13	31,974
The year.....	.....	.....	.....	.....	13.33	3,197,990

## SESSIONAL PAPER No. 25c

## BLINDMAN RIVER NEAR BLACKFALDS.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 16, Tp. 39, Rge. 27, W. 4th Mer., at the traffic bridge over the Blindman River, about two miles southwest of the town of Blackfalds and on the old Edmonton trail. About 200 feet downstream from the Canadian Pacific Railway bridge.

*Records.*—Miscellaneous measurements were made at this station from August 10, 1912, to July 1, 1914, and since that time regular measurements have been made.

*Gauge.*—No gauge established owing to the difficulty of procuring an observer.

*Bench-mark.*—Painted with white paint on the upstream face of the concrete pier on the right bank, and marked with a broad arrow. Assumed elevation, 100.00 feet.

*Channel.*—One fairly permanent channel, mud and large boulders.

*Discharge measurements.*—Made from a bridge.

*Winter measurements.*—Stream affected by ice from November to April.

*Floods.*—A highwater mark of 98.14 feet was reached on or about June 27, 1915, and the discharge was approximately 2,560 sec.-feet.

*Observer.*—None.

## DISCHARGE MEASUREMENTS of Blindman River near Blackfalds, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Elevation of Water Surface.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 6.....	H. S. Kerby.....	90	125	0.09	91.11	11.4
Feb. 27.....	H. W. Rowley.....	41	38	0.24	90.97	9.1
Mar. 20.....	R. J. McGuinness.....	62	138	0.98	91.88	135.0
April 17.....	I. K. Strome.....	64	126	0.97	91.55	122.0
May 5.....	do.....	66	144	1.24	91.86	178.0
May 22.....	do.....	64	125	0.77	91.51	96.0
June 8.....	do.....	94	286	2.44	93.44	697.0
July 12.....	do.....	97	322	2.36	93.63	758.0
Aug. 14.....	do.....	68	130	0.79	91.53	102.0
Sept. 1.....	do.....	67	122	0.72	91.50	88.0
Sept. 21.....	do.....	69	146	1.02	91.71	148.0
Oct. 12.....	do.....	68	144	0.98	91.70	141.0
Oct. 23.....	do.....	68	138	0.89	91.60	123.0
Dec. 4.....	F. K. Beach.....	64	108	0.28	.....	30.0
Dec. 30.....	do.....	58	117	0.27	91.60	32.0

No gauge at station. Elevation of water surface taken on each visit to station.

## RED DEER RIVER AT DRUMHELLER.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 11, Tp. 29, Rge. 20, W. 4th Mer.

*Records available.*—October 25 to December 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero maintained at 2,220.22 feet.

*Bench-mark.*—Canadian topographic survey bench-mark copper plug on right abutment, downstream side. Elevation, 2,246.89 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made from bridge.

*Observer.*—S. W. Cameron.

*Remarks.*—This station was established on October 25, 1915.

## DISCHARGE MEASUREMENTS of Red Deer River at Drumheller, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Nov. 27.....	F. K. Beach.....	322.8	978	1.07	4.13	1,051
Dec. 22.....	do.....	330.0	1,119	0.67	4.90	754

## DAILY GAUGE HEIGHT AND DISCHARGE of Red Deer River at Drumheller, for 1915.

DAY.	October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			4.17		4.67	1,055
2.....			4.17		4.85	1,055
3.....			4.16		4.76	1,033
4.....			4.11		4.66	1,050
5.....			4.05		4.75	1,047
6.....						
7.....			3.97 <sup>a</sup>		4.77	1,045
8.....			3.94		5.00	1,042
9.....			3.94		5.00	1,040
10.....			3.81		4.83	1,037
11.....			3.46		5.14	1,030
12.....						
13.....			3.18		5.25	1,021
14.....			3.12		5.34	1,015
15.....			3.26		5.38	998
16.....			2.81		5.27	972
17.....			3.34		5.15	946
18.....						
19.....			3.46		5.15	918
20.....			3.67		5.00	885
21.....			3.69		5.00	860
22.....			3.89		4.95	840
23.....			4.10		4.95	817
24.....						
25.....			4.35		4.98	790
26.....			4.24		4.90	754
27.....			3.95		4.85	748
28.....			4.07		4.50	690
29.....			4.10		4.72	696
30.....	4.41					
31.....						
32.....	4.37		4.13		4.60	680
33.....	4.33		4.16	1,051	4.60	655
34.....	4.27		4.45	1,055	4.45	633
35.....	4.24		4.34	1,055	4.40	618
36.....	4.25		4.60	1,055	4.42	610
37.....	4.17				4.20 <sup>a</sup>	535

First measurement made Nov. 27.  
<sup>a-a</sup> Ice conditions Nov. 6 to Dec. 31.

## MONTHLY DISCHARGE of Red Deer River at Drumheller, for 1915.

(Drainage area 8,890 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
November (27-30).....	1,055	1,051	1,054	0.119	0.02	8,360
December.....	1,055	535	875	0.0986	0.11	53,802
The period.....					0.13	62,162

First measurement made Nov. 27.



## SOUTH SASKATCHEWAN RIVER DRAINAGE BASIN.

*General Description.*

The upper portion of this drainage basin will be dealt with in the descriptions of the drainage basins of Bow, Little Bow, Oldman, Waterton, Belly and St. Mary Rivers. These streams are all conjoined at a point known as the Grand Forks, to form the South Saskatchewan River. From the Grand Forks the river flows in a north and easterly direction to its junction with the North Saskatchewan River a short distance east of the city of Prince Albert. From this point onward the stream takes the name of Saskatchewan River.

After the confluence of the Bow and Oldman Rivers the stream receives comparatively little drainage, the principal tributaries being the Red Deer River, draining that portion of the basin between the North and the South Saskatchewan River, and Sevenpersons River and Swiftcurrent Creek emptying into the main stream from the south. Descriptions of the drainage basins of all these streams are given elsewhere in this report.

The drainage basin of this stream is quite similar to that of all such streams which have their source in the mountains and flow across the prairies. The upper portion of the basin has considerable fall, with rock and gravel formation and a good growth of timber. In contrast to this the prairie section of the basin is sparsely wooded, except along the banks of the stream, and the rock formation changes to earth; also the stream is more apt to change its channel, especially in times of flood. The high water occurs in the hot months of summer and is caused by the melting of the snow fields in the mountains. The low water occurs in the winter months when there is no melting snow to augment the stream flow. Unusually high water and floods follow rains of more than usual intensity in the upper section of the river. The South Saskatchewan River is much less liable to destructive floods than is the North Saskatchewan River.

In addition to the gauging stations on the tributaries, which are taken up in detail elsewhere in this report, there are two stations on the main streams. These stations are located at the cities of Medicine Hat and Saskatoon.

Up to the present the chief value of this stream has been as a source of municipal water supply. There are no irrigation schemes or water power developments on the main stream.

The cities of Medicine Hat and Saskatoon derive their water supply from this stream. The South Saskatchewan is also being considered as a possible source of supply for the cities of Moosejaw and Regina. In this connection surveys were carried out during 1913 by this department and also by the Provincial Government.

A special report upon the floods in this drainage basin is given in Appendix No. 4 of this report.

## SOUTH SASKATCHEWAN RIVER AT MEDICINE HAT.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 31, Tp. 12, Rge. 5, W. 4th Mer., at the traffic bridge in the city of Medicine Hat.

*Records available.*—From May 31, 1911, to December 31, 1915.

*Gauge.*—Standard chain gauge. Zero elevation maintained at 79.78 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Shifting, owing to sand bed.

*Discharge measurements.*—Made from traffic bridge.

*Winter flow.*—Observations taken during winter months.

*Floods.*—Few records of floods at this point are available. The highest water of which we have record took place June 28, 1915, with a stage of 15.30 feet and a flow of 90,020 sec.-ft.

*Observer.*—W. King.

## DISCHARGE MEASUREMENTS of South Saskatchewan River at Medicine Hat, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 7.	J. E. Caughey	433	2,660	1.00	3.26	2,653
Feb. 12, 13.	F. R. Steinberger	510	1,850	1.04	2.87	1,892
Mar. 3, 4.	do	515	1,810	1.07	3.09	1,944
April 7.	H. B. R. Thompson	504	3,461	1.89	3.25	6,528
April 22.	do	506	3,443	1.84	3.26	6,346
May 31.	R. J. McGuinness	759	6,278	3.43	7.00	21,551
June 9.	do	792	7,312	3.92	7.85	28,665
June 28.	W. H. Snelson	852	13,121	6.84	15.30	89,797
June 28.	do	847	12,144	6.44	14.02	78,179
June 29.	do	849	12,212	6.15	14.22	75,035
June 30.	do	845	10,562	5.39	12.20	56,915
July 2.	do	834	9,192	5.04	10.58	46,333
July 3.	do	834	9,180	5.09	10.58	46,757
July 16.	H. B. R. Thompson	836	7,865	4.95	10.00	38,935
Aug. 24.	do	751	5,616	3.64	7.16	20,450
Sept. 21.	do	531	3,419	2.07	3.87	7,076
Oct. 16.	do	531	2,987	2.09	3.93	6,244
Nov. 9.	W. R. McCaffrey	502	3,489	1.72	3.42	6,013
Nov. 25.	do	617	3,290	0.96	4.86	3,146
Dec. 6.	do	509	3,274	0.95	3.97	3,109
Dec. 18.	do	464	2,686	0.82	2.97	2,211

## DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan River at Medicine Hat, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	3.37	2,830	2.66	1,890	2.80	2,000	4.00	7,830	3.35	5,895	7.03	21,714
2.	3.33	2,860	2.52	1,960	2.85	1,990	3.12	5,292	3.32	5,814	6.94	21,192
3.	3.34	2,840	2.54	2,010	2.90	1,980	3.42	6,084	3.40	6,030	6.77	20,219
4.	3.37	2,800	2.60	2,015	3.05	1,960	3.52	6,358	4.98	11,458	6.76	20,162
5.	3.37	2,790	2.70	2,010	2.80	1,950	3.72	6,940	6.31	17,664	7.87	26,633
6.	3.28	2,730	2.70	2,020	2.90	1,970	3.28	5,708	6.13	16,716	8.09	27,949
7.	3.30	2,650	2.50	2,030	2.91	1,980	3.15	5,370	5.96	15,854	8.42	30,028
8.	3.32	2,700	2.20	2,020	3.01	1,980	2.91	4,774	5.82	15,176	8.25	28,945
9.	3.30	2,800	2.70	2,025	2.95	1,990	3.10	5,240	5.67	14,472	7.86	26,574
10.	3.28	2,770	3.00	2,030	3.00	2,000	2.72	4,349	5.78	14,986	7.86	26,574
11.	3.32	2,730	3.21	1,980	3.02	2,000	2.68	4,261	6.73	19,991	7.74	25,866
12.	3.10	2,650	3.00	1,900	2.78	1,820	2.61	4,107	6.99	21,482	7.76	25,984
13.	3.07	2,570	2.86	1,890	2.84	1,840	2.61	4,107	6.92	21,076	7.56	24,804
14.	2.92	2,440	2.95	1,900	2.92	1,870	2.64	4,173	6.93	21,134	7.46	24,214
15.	3.00	2,160	2.92	1,930	3.00	1,900	2.32	3,490	6.84	20,618	7.38	23,744
16.	3.05	1,970	2.95	1,950	3.05	1,940	2.31	3,470	7.88	26,692	7.74	25,866
17.	3.05	2,000	2.98	1,970	3.16	2,120	2.78	4,481	8.74	32,100	8.18	28,506
18.	3.05	2,080	3.18	1,980	3.38	3,000	2.90	4,750	8.16	28,382	8.42	30,028
19.	2.98	2,160	2.75	1,980	3.20	5,500a	2.86	4,660	7.70	25,630	8.28	29,134
20.	2.88	2,200	2.78	1,980	4.25	8,600	2.86	4,660	7.62	25,158	9.30	35,780
21.	2.80	2,200	2.75	1,970	5.78	14,900	3.16	5,396	7.52	24,568	9.58	37,700
22.	2.78	2,140	2.72	1,980	5.75	14,800	3.17	5,422	7.12	22,236	9.23	35,311
23.	2.75	2,040	2.78	1,990	5.91	15,600	3.15	5,370	6.60	19,260	8.82	32,620
24.	2.75	1,950	2.90	2,000	6.08	16,400	3.56	6,474	6.61	19,316	8.38	29,772
25.	2.76	1,860	3.12	2,020	6.12	16,650	3.82	7,244	6.48	18,590	8.05	27,705
26.	2.90	1,780	2.90	2,030	5.48	13,600	3.48	6,246	6.61	19,316	8.28	29,134
27.	2.90	1,740	2.78	2,020	5.51	13,700	3.59	6,561	7.02	21,656	9.00	33,790
28.	2.80	1,720	2.78	2,010	5.15	12,150	3.42	6,084	7.33	23,454	14.63	84,700
29.	2.74	1,730	.....	.....	4.65	10,150a	3.32	5,814	7.12	22,236	14.18	77,400
30.	2.62	1,750	.....	.....	3.75	7,030	3.25	5,630	7.00	21,540	12.05	56,200
31.	2.58	1,810	.....	.....	3.42	6,084	.....	.....	6.99	21,482	.....	.....

a-a Estimated.



South Saskatchewan River in flood at Saskatoon, on July 3, 1915. Taken at time of maximum stage. High level traffic bridge in background. Taken by F. K. Beach.



South Saskatchewan River in flood at Saskatoon, on July 4, 1915. Taken shortly after maximum stage. Shows the Canadian Northern Railway Company's bridge, where our gaugings are made. Taken by F. K. Beach.



## SOUTH SASKATCHEWAN RIVER DRAINAGE BASIN

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DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan River at Medicine Hat, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	10.98	47,896	8.91	33,205	4.72	10,418	4.06	8,028	3.44	6,138	3.42	3,130
2.....	10.55	44,650	8.30	29,260	4.45	9,395	4.01	7,863	4.00	7,530	2.90	3,120
3.....	10.55	44,650	8.30	29,260	4.75	10,535	3.92	7,566	3.38	5,976	3.90	3,120
4.....	10.14	41,668	8.10	28,010	4.60	9,960	3.90	7,500	3.63	6,677	4.00	3,130
5.....	9.94	40,244	7.76	25,954	4.50	9,580	3.94	7,632	3.39	6,003	4.88	3,140
6.....	9.42	36,596	7.34	23,512	4.88	11,050	3.40	6,030	3.45	6,165	3.97	3,109
7.....	9.20	35,110	7.10	22,120	4.92	11,212	3.94	7,632	3.37	5,949	4.06	2,970
8.....	9.10	34,450	6.84	20,618	4.57	9,846	4.04	7,962	3.32	5,814	4.38	2,870
9.....	8.88	33,010	6.65	19,540	4.38	9,135	4.08	8,094	3.41	6,057	4.58	2,700
10.....	9.04	34,054	6.39	18,096	4.38	9,138	4.24	8,640	3.01	5,680c	4.45	2,550
11.....	8.64	31,450	6.20	17,080	4.65	10,150	4.16	8,364	2.99	4,700	4.23	2,350
12.....	8.25	28,945	6.07	16,407	4.22	8,570	4.08	8,094	3.41	4,500	3.99	2,150
13.....	7.95	27,105	5.90	15,560	4.43	9,321	3.94	7,632	3.13	4,420	2.98	2,070
14.....	7.62	25,158	5.74	14,798	4.44	9,358	3.88	7,436	3.16	4,350	3.01	2,090
15.....	7.28	23,164	5.63	14,288	4.24	8,640	3.96	7,698	3.47	4,250	2.97	2,100
16.....	9.92	40,102	5.63	14,288	3.98	7,764	3.70	6,880	3.94	4,150	2.91	2,130
17.....	9.24	35,378	5.56	13,966	3.90	7,500	3.79	7,150	4.18	4,030	3.25	2,170
18.....	8.52	30,670	5.54	13,874	3.72	6,940	3.87	7,404	4.64	3,880	2.97	2,211
19.....	9.38	36,324	5.42	13,330	3.85	7,340	3.87	7,404	4.93b	3,750	2.37	2,270
20.....	9.75	38,895	5.40	13,240	3.68	6,822	3.65	6,735	5.32	3,630	2.45	2,300
21.....	9.12	34,582	5.46	13,510	3.78	7,120	3.59	6,561	5.62	3,480	2.86	2,330
22.....	8.52	30,670	6.25	17,345	3.95	7,665	3.59	6,561	5.27	3,350	2.94	2,280
23.....	8.05	27,705	7.73	25,807	3.99	7,797	3.62	6,648	6.01	3,240	3.06	2,240
24.....	7.82	26,338	7.26	23,048	4.02	7,896	3.54	6,416	5.68	3,160	2.81	2,170
25.....	7.68	25,512	6.44	18,370	3.85	7,340	3.59	6,561	4.91b	3,146	2.75	2,100
26.....	7.61	25,099	5.94	15,756	4.12	8,228	3.42	6,084	5.01	3,145	2.90	2,000
27.....	7.48	24,332	5.58	14,058	4.41	9,247	3.48	6,246	4.39	3,170	2.78	1,900
28.....	7.66	25,394	5.39	13,196	4.54	9,732	3.42	6,084	3.63	3,180	2.79	1,850
29.....	7.78	26,102	5.22	12,456	4.28	8,780	3.26	5,656	3.71	3,150	3.19	1,800
30.....	8.55	30,865	5.10	11,950	4.04	7,962	3.34	5,868	4.12	3,140	2.81	1,710
31.....	9.45	36,800	4.78	10,652	.....	.....	3.40	6,030	.....	.....	2.88	1,660

b-b Gauge heights interpolated from readings to top of ice.

c Ice conditions from Nov. 10.

## MONTHLY DISCHARGE of South Saskatchewan River at Medicine Hat, for 1915.

(Drainage area 20,870 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	2,860	1,720	2,305	0.110	0.13	141,728
February.....	2,030	1,890	1,982	0.095	0.10	110,073
March.....	16,650	1,820	6,176	0.030	0.35	379,747
April.....	7,830	3,470	5,345	0.256	0.29	318,050
May.....	32,100	5,814	19,354	0.927	1.07	1,190,031
June.....	84,700	20,162	32,275	1.547	1.73	1,920,496
July.....	47,896	23,164	32,997	1.581	1.82	2,628,906
August.....	33,205	10,652	18,470	0.880	1.61	1,135,676
September.....	11,212	6,822	8,815	0.422	0.47	224,539
October.....	8,640	5,656	7,112	0.341	0.39	437,500
November.....	7,830	3,140	4,537	0.217	0.24	264,950
December.....	3,140	1,660	2,378	0.114	0.13	146,218
The year.....	.....	.....	.....	.....	7.73	8,662,736

## SOUTH SASKATCHEWAN RIVER AT SASKATOON.

Location.—On the SW. ¼ Sec. 28, Tp. 36, Rge. 5, W. 3rd Mer., at the Canadian Northern Railway bridge in the city of Saskatoon.

Records available.—May 27, 1911, to December 31, 1915.

Gauge.—Chain. Elevation of zero maintained at 1,543.22 feet since establishment

*Bench-marks.*—Painted mark on side of downstream end of left abutment. Elevation, 1,568.98 feet, referred to a bench-mark on top of hydrant 300 feet northeast; elevation, 1,586.94 feet (Geodetic survey datum) and to Geodetic B.M., No.30, brass plug in south end Canadian Northern Railway station. Elevation, 1,593.14 feet above mean sea level.

*Channel.*—Permanent.

*Maximum flow.*—A gauge height of 20.85 feet with discharge of 114,100 sec.-feet was reached on July 3, 1915.

*Open water.*—April 4 to November 11, 1915.

*Discharge measurements.*—From bridge.

*Observer.*—A. B. Hay.

#### DISCHARGE MEASUREMENTS of South Saskatchewan River at Saskatoon, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 11, 12, 13.....	F. R. Steinberger.....	509.0	1,772	1.91	4.41	3,385
Feb. 12, 13.....	E. W. W. Hughes.....	527.0	1,371	1.73	4.04	2,366
Mar. 4, 5.....	do.....	522.0	1,554	1.74	4.02	2,708
Mar. 22.....	do.....	556.0	1,779	1.75	4.03	3,118
April 13, 14.....	do.....	627.0	3,847	3.25	6.16	12,504
May 3, 4.....	do.....	523.0	2,858	2.69	4.79	7,701
June 10, 11.....	F. K. Beach.....	784.0	9,000	5.00	12.12	45,000
July.....	do.....	793.5	9,444	5.67	12.75	53,515
July 1.....	do.....	815.5	12,462	6.85	16.40	85,344
July 2.....	do.....	829.5	15,750	7.20	20.45	113,539
July 3.....	do.....	829.5	16,028	7.12	20.80	114,131
July 3.....	do.....	829.0	15,842	7.01	20.60	111,161
July 9.....	do.....	801.5	10,483	5.56	14.00	58,233
Aug. 13, 14.....	do.....	772.5	7,495	4.08	9.84	30,566
Sept. 9, 10.....	do.....	701.5	4,651	3.55	6.95	16,516
Oct. 6, 7.....	do.....	627.5	4,165	3.48	6.47	14,530
Nov. 2, 3.....	F. R. Steinberger.....	573.0	3,480	2.74	5.39	9,554
Dec. 17, 18.....	do.....	517.0	2,787	1.48	6.10	4,141

#### DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan River at Saskatoon, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.80a	3,200	4.17	2,400	4.18	2,750	5.32	7,200	4.65	7,375	9.11	26,505
2.....	3.98	3,400	4.12	2,400	4.05	2,750	7.30	13,800	4.81	7,830	9.40	28,100
3.....	4.02	3,450	4.07	2,300	4.03	2,750	10.13	25,956	4.81	7,830	9.63	29,365
4.....	4.05	3,050	4.08	2,200	4.00	2,700	9.05a	26,220	4.86	7,980	9.75	30,025
5.....	4.10	3,250	4.09	2,200	4.03	2,700	11.95	43,880	4.91	8,130	9.61	29,255
6.....	4.12	3,450	4.12	2,200	4.08	2,750	8.42	22,800	4.86	7,980	9.58	29,090
7.....	4.10	2,800	4.05	2,150	4.16	2,800	7.68	19,160	4.85	7,950	9.51	28,705
8.....	4.10	3,000	3.97	2,150	4.12	2,800	7.83	19,950	4.87	8,010	9.35	27,825
9.....	4.18	3,400	3.91	2,150	4.08	2,900	8.00	20,700	4.79	7,770	9.38	27,990
10.....	4.28	3,500	3.89	2,200	4.06	2,900	7.90	20,200	4.91	8,130	10.84	36,775
11.....	4.38	3,400	3.84	2,200	4.05	3,000	7.65	19,025	5.64	10,490	12.19	45,435
12.....	4.40	3,400	3.83	2,300	4.05	3,000	6.60	14,420	7.37	17,765	11.66	42,025
13.....	4.45	3,500	3.98	2,350	4.05	3,000	6.40	13,580	7.52	18,440	11.28	39,590
14.....	4.50	3,600	3.82	2,350	4.09	3,050	6.02	11,985	7.47	18,215	10.99	37,735
15.....	4.62	3,700	3.86	2,300	4.14	3,100	5.75	10,900	7.40	17,900	10.89	37,095
16.....	4.65	3,800	3.90	2,200	4.10	3,100	5.54	10,140	7.52	18,440	10.72	36,010
17.....	4.65	4,000	3.90	2,150	4.07	3,100	5.32	9,370	8.12	21,300	10.69	35,815
18.....	4.60	4,100	3.84	2,150	4.07	3,100	5.14	8,820	8.92	25,460	10.56	34,985
19.....	4.55	4,100	3.79	2,200	4.10	3,100	4.98	8,340	9.22	27,110	10.34	33,610
20.....	4.55	4,100	3.92	2,200	4.07	3,100	4.86	7,950	9.20	27,000	10.34	33,610
21.....	4.55	4,000	4.08	2,350	4.02	3,100	4.72	7,560	9.08	26,340	10.39	33,920
22.....	4.48	3,900	4.18	2,450	4.06	3,100	4.55	7,125	10.08	31,995	11.04	38,055
23.....	4.40	3,600	4.12	2,600	4.12	3,200	4.38	6,715	10.53	34,790	11.31	39,785
24.....	4.32	3,400	4.11	2,600	4.16	3,400	4.35	6,650	10.41	34,040	11.41	40,425
25.....	4.24	3,200	4.16	2,700	4.25	3,600	4.42	6,810	10.27	33,175	11.07	44,010
26.....	4.24	3,000	4.18	2,700	4.22	3,800	4.47	6,930	10.11	32,180	12.61	48,170
27.....	4.30	2,900	4.19	2,750	4.18	4,000	4.42	6,810	9.93	31,080	12.23	45,695
28.....	4.37	2,800	4.24	2,750	4.23	4,400	4.45	6,880	9.71	29,805	11.75	42,600
29.....	4.36	2,650	.....	.....	4.25	4,800	4.56	7,150	9.33	27,715	11.67	41,450
30.....	4.31	2,600	.....	.....	4.36	5,200	4.55	7,125	9.08	26,340	11.45	40,680
31.....	4.22	2,500	.....	.....	4.68	5,800	.....	.....	8.95	25,625	.....	.....



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan River at Saskatoon, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	12.70a	53,298	11.91	43,625	9.03	26,355	6.15	13,325	5.44	9,820c	4.51	4,200
2.....	20.05a	111,008	11.86	43,305	8.63	24,350	6.13	13,255	5.39	9,615	5.16	4,300
3.....	20.60a	111,012	11.89	43,495	8.33	22,885	6.19	13,465	5.37	9,545	5.48	4,400
4.....	17.80a	84,617	12.71	48,870	8.07	21,635	6.21	13,540	5.17	8,910	5.37	4,500
5.....	14.95a	66,312	13.79	56,645	7.77	20,240	6.43	14,420	5.12	8,760	5.56	4,400
6.....	14.87	64,810	12.91	50,270	7.58	19,370	6.48	14,620	5.05	8,550	5.56	4,300
7.....	14.83	64,510	12.43	46,995	7.41	18,605	6.24	13,660	5.02	8,460	5.60	4,250
8.....	14.47	61,770	12.25	45,825	7.15	17,460	6.10	13,120c	5.10	8,700	5.88	4,300
9.....	14.04	58,505	11.89	43,495	6.96	16,630	6.10	13,090	5.44	9,790	6.12	4,300
10.....	13.68	55,830	11.30	40,270	6.90	16,380	6.12	13,130	5.37	9,545	6.18	4,100
11.....	13.01	50,970	10.68	35,750	6.72	15,625	6.14	13,170	4.80	7,800b	6.00	3,750
12.....	12.85	49,850	10.48	34,475	6.92	16,465	6.15	13,175	3.62	5,270	6.16	4,050
13.....	12.63	48,310	10.10	32,120	7.09	17,195	6.22	13,400	3.25	4,780	5.99	3,750
14.....	12.31	46,215	9.75	30,150	6.93	16,505	6.45	14,290	3.06	4,400	6.06	3,900
15.....	12.21	45,565	9.38	28,175	6.69	15,500	6.50	14,460	2.94	4,200	6.14	4,150
16.....	12.03	44,395	9.08	26,615	6.52	14,785	6.50	14,430	3.04	4,250	6.04	4,100
17.....	11.71	42,345	8.98	26,100	6.62	15,205	6.41	14,040	3.35	4,300	6.05	4,150
18.....	11.23	39,270	8.85	25,450	6.62	15,205	6.28	13,500	3.48	4,350	6.16	4,200
19.....	10.88	37,030	8.63	24,350	6.57	14,995	6.20	13,100	3.61	4,350	6.28	4,800
20.....	10.78	36,390	8.37	23,075	6.46	14,540	6.10	12,660	3.64	4,400	6.22	4,700
21.....	14.77	64,050	8.12	21,875	6.42	14,380	6.07	12,525	3.73	4,400	6.11	4,500
22.....	15.77	71,705	8.09	21,730	6.34	14,060	6.04	12,370	3.65	4,250	5.85	4,000
23.....	16.37	76,460	7.97	21,160	6.20	13,500	5.98	12,120	3.91	4,400	5.73	3,600
24.....	17.87	88,595	7.87	20,700	6.12	13,220	5.88	11,690	4.28	4,500	5.64	3,000
25.....	16.44	77,020	7.75	20,150	6.04	12,940	5.78	10,260	4.45	4,500	5.44	2,750
26.....	15.17	67,090	7.73	20,060	5.94	12,590	5.85	11,510	4.42	4,250	5.45	2,800
27.....	14.38	61,090	7.99	21,255	5.88	12,380	5.70	10,880	4.35	4,300	5.46	2,850
28.....	13.52	54,650	11.71	42,345	5.86	12,310	5.60	10,500	4.44	4,400	5.34	2,750
29.....	12.90	50,200	11.99	44,135	5.91	12,485	5.52	10,190	4.52	4,450	5.30	2,550
30.....	12.56	47,840	10.37	33,795	6.03	12,905	5.54	10,230	4.42	4,160	5.74	2,900
31.....	12.29	46,085	9.56	29,125	.....	.....	5.49	10,025	.....	.....	6.24	3,200b

a Mean gauge height and discharge from frequent observations. Maximum gauge height July 3, 20.85, maximum discharge, 114,130.

b-b Ice conditions.

c-c Shifting conditions.

## MONTHLY DISCHARGE of South Saskatchewan River at Saskatoon, for 1915.

(Drainage area 64,500a square miles.)

MONTH.	DISCHARGE IN SECOND-Feet.				Run-Off	
	Maximum.	Minimum.	Mean.	Per square Mile	Depth in inches on Drainage Area	Total in Ac.-inches.
January.....	4,100	2,500	3,370	0.082	0.68	287,787
February.....	2,770	2,150	2,445	0.038	0.04	189,234
March.....	5,800	2,700	3,118	0.041	0.08	264,470
April.....	43,880	6,640	13,472	0.209	0.27	861,847
May.....	34,790	7,315	10,818	0.167	0.38	1,718,834
June.....	48,170	20,540	36,144	0.566	0.92	2,386,718
July.....	111,012	36,380	86,538	1.249	1.08	2,726,085
August.....	56,645	20,060	38,794	0.597	0.61	2,501,235
September.....	26,355	13,310	18,337	0.284	0.28	713,898
October.....	14,620	10,025	12,714	0.187	0.29	781,798
November.....	8,820	4,200	6,148	0.098	0.11	484,444
December.....	4,800	2,550	3,655	0.060	0.17	257,453
The year.....					9.72	12,586,487

a The drainage area given in this table is only approximate. It must be remembered that the greater part of the run-off at this station is derived from the eastern slope of the Rocky Mountains, and must not be taken to indicate estimates of run-off on other streams in this territory.



## BOW RIVER DRAINAGE BASIN.

*General Description.*

Bow River rises in Lakes Bow and Hector, which are situated in the Rocky Mountains Park, north of the main line of the Canadian Pacific Railway and just east of the Great Divide, and whose elevations are 6,420 and 5,694 feet, respectively, above mean sea level. The river flows in a south and easterly direction to the city of Calgary, where it takes a big bend to the south, and then continues in a south and easterly direction to its junction with the Belly River at the Grand Forks. Below this point the united stream is known as the South Saskatchewan River.

Bow River has a large number of tributaries in the western portion of its course. Of these the principal are Cascade and Ghost Rivers draining the northern slopes of the basin, and the Spray, Kananaskis, Elbow, Sheep and Highwood Rivers draining the southern slopes. Below the mouth of Highwood River, very little drainage reaches Bow River. Crowfoot Creek being the largest tributary, and so it appears that most of the water supply is derived from the run-off from mountains and foot-hills. As a result, Bow River possesses a normally steady flow throughout the year, but it is subject to sudden freshets caused by melting snow and heavy rains in the mountains. The minimum flow occurs in the frozen season, when there is little run-off from the snowfields in the western part of the drainage basin.

The valley of the Bow is deep and well defined throughout its course. In the mountain section it is comparatively narrow and is very heavily timbered, while its bed is stony and its banks high and rocky. The nature of the valley gradually changes as it approaches the prairies when it widens out, becomes of a clay formation and is devoid of trees, the actual bed consisting for the most part of gravel. The water is clean and pure. A large quantity of water is diverted from the Bow River for irrigation purposes. The two chief users are the Department of Natural Resources, Canadian Pacific Railway Company, and the Southern Alberta Land Company.

The Department of Natural Resources diverts water at two points, one just east of the city of Calgary and the other three miles southwest of Bassano. The first system has been in operation for several years and distributes water over the Western Section of the Company's Irrigation block, which extends east as far as Cluny. The works at Bassano comprise a very large earth-filled dam and concrete spillway, which were completed in 1913. This system is to serve the Eastern Section of the Company's Irrigation block, which extends east from Bassano. In all, it is proposed to irrigate about 625,000 acres of land.

The Southern Alberta Land Company has a dam and reservoir near Namaka. These works were practically completed in 1913. It is proposed to irrigate by this system about 200,000 acres.

There are many favourable sites for power development on the Bow River, but only one company has, up to the present, developed power. The Calgary Power Company has two plants; one is at Kananaskis Falls, at the confluence of the Kananaskis and Bow Rivers, near Seebe station; the other at Horseshoe Falls, two miles below. The latter plant has been in operation for some years and has a capacity of 19,500 horse power. The dam at Kananaskis Falls was completed in 1913 and this plant has a rated capacity of 11,600 horse power. Nearly all the power developed is used by the city of Calgary.

The city of Calgary obtains its domestic water supply from the Elbow River. The intake is about twelve miles southwest of Calgary, above which point the course of the river is through a wild and unsettled country, where there is no possibility of human contamination.

The town of Bassano obtains its domestic water supply from the Bow River at the Canadian Pacific Railway Company's dam three miles southwest of the townsite.

A special report upon the floods in this drainage basin is given in Appendix No. 4 of this report.

## BATH CREEK NEAR LAKE LOUISE.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 32, Tp. 28, Rge. 16, W. 5th Mer., and one and one-quarter miles west of Lake Louise station, near the mouth of the stream.

*Records available.*—May 25 to September 20, 1913. Discharge measurements only in 1914. May 23 to December 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero maintained at 89.59 feet during 1913. Elevation of zero maintained at 90.54 feet during 1914-15.

*Bench-mark.*—Downstream corner of right concrete abutment. Assumed elevation, 100.00 feet.

*Channel.*—Gravel shifting.

*Discharge measurements.*—Made by wading.

*Observer.*—Alex. Johnston, May 23 to July 7; D. Prescott, July 8 to December 31.



Bow River in flood at Calgary, on June 18, 1897. Looking west from a point on right bank of river near Langevin bridge. This photograph was given to us by Mr. Tom Birnie, who lived in Calgary at the time the flood occurred.

PLATE 17



Bow River in flood at Calgary, on June 18, 1897, — looking east. Note the Langevin bridge on left. The white house beside the feed stable is still unmoved. It is No. 410 on 4th St. East. Mr. Tom Birnie, who lived in this house at the time of the flood, gave us this photograph. The water was within an inch of the window sill on this occasion. The feed stable, since this photograph was taken, has been moved across the street.



## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Bath Creek near Lake Louise, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 12.....	H. C. Ritchie.....	26.0	12.6	0.96	0.95	12.0
Jan. 29.....	do.....	26.0	12.3	0.95	0.92	11.6
Feb. 9.....	do.....	26.2	11.5	0.98	0.90	11.3
Feb. 23.....	do.....	26.2	11.5	0.96	0.88	11.1
Mar. 9.....	do.....	27.0	11.7	0.83	0.85	9.7
Mar. 23.....	do.....	27.0	12.9	0.97	1.05	12.4
April 6.....	do.....	27.8	14.5	1.19	1.05	17.2
April 22.....	O. H. Hoover.....	28.5	15.7	1.40	1.18	22.0
May 14.....	H. C. Ritchie.....	29.8	24.6	2.20	1.57	54.0
May 27.....	do.....	31.0	25.6	2.25	1.61	57.0
June 10.....	do.....	31.5	27.0	2.48	1.68	67.0
June 23.....	do.....	41.5	44.7	3.90	2.14	174.0
July 20.....	do.....	43.0	55.1	4.34	2.32	239.0
Aug. 10.....	do.....	44.0	61.9	4.42	2.58	273.0
Sept. 2.....	do.....	41.5	47.4	3.68	2.20	174.0
Sept. 30.....	do.....	29.2	24.8	2.00	1.53	50.0
Oct. 21.....	do.....	28.0	20.4	1.48	1.32	30.0
Nov. 3.....	do.....	28.0	20.7	1.54	1.30	32.0
Nov. 17.....	J. E. Caughey.....	26.0	16.4	1.36	1.20	32.0
Dec. 3.....	do.....	27.0	18.9	1.13	1.13	21.0
Dec. 15.....	H. C. Ritchie.....	27.0	14.3	1.15	1.12	16.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Bath Creek near Lake Louise, for 1915.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.68	66	2.38	235	2.60	310		
2.....	1.70	69	2.36	228	2.70	345		
3.....	1.67	65	2.30	209	2.67	334		
4.....	1.69	68	2.40	241	2.70	345		
5.....	1.70	69	2.50	275	2.72	352		
6.....	1.68	66	2.58	303	2.75	363		
7.....	1.67	65	2.60	310	2.77	369		
8.....	1.70	69 <sup>a</sup>	2.60	310	2.77	369		
9.....	1.68	66	2.46	261	2.78	373		
10.....	1.64	61	2.34	222	2.75	363		
11.....	1.60	56	2.20	179	2.70	345		
12.....	1.58	54	2.20	179	2.65	328		
13.....	1.60	56	2.18	173	2.67	334		
14.....	1.72	72 <sup>a</sup>	2.16	167	2.70	345		
15.....	1.76	79	2.15	164	2.70	345		
16.....	1.90	103	2.15	164	2.60	310		
17.....	2.12	156	2.15	164	2.62	317		
18.....	2.10	150	2.20	179	2.60	310		
19.....	2.12	156	2.25	194	2.55	293		
20.....	1.98	121	2.30	209	2.50	275		
21.....	1.92	107	2.45	258	2.60	310		
22.....	1.94	112	2.55	293	2.63	317		
23.....	1.98	121	2.55	293	2.65	328		
24.....	1.50	45	1.98	121	2.55	293		
25.....	1.60	56	1.94	112	2.60	310		
26.....	1.70	69	2.20	179	2.58	309		
27.....	1.60	56	2.90	415	2.55	293		
28.....	1.59	55	2.84	394	2.53	289		
29.....	1.61	57	2.30	209	2.50	275		
30.....	1.70	69	2.46	261	2.55	293		
31.....	1.60	56	2.40	241	2.60	310		
31.....	1.58	54			2.63	320		

<sup>a</sup> to a Gauge heights interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of Bath Creek near Lake Louise, for 1915.—*Concluded.*

DAY.	September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.35	225	1.58	54	1.27	27	1.11	18
2.....	2.20	179	1.53	48	1.30	29	1.10	18
3.....	2.35	225	1.53	48	1.27	27	1.12	19
4.....	2.37	231	1.50	45	1.27	27	1.12	19
5.....	2.15	164	1.48	43	1.25	26	1.10	18
6.....	2.15	164	1.46	41	1.30	29	1.10	18
7.....	2.00	125	1.45	40	1.25	26	1.09	18
8.....	1.97	118	1.45	40	1.24	25	1.09	18
9.....	1.95	114	1.43	39	1.24	25	1.12	19
10.....	1.92	107	1.42	38	1.20	23	1.12	19
11.....	1.90	103	1.40	36	1.23	25	1.10	18
12.....	1.87	99	1.40	36	1.19	22	1.10	18
13.....	1.75	77	1.37	34	1.20	23	1.10	18
14.....	1.73*	74	1.35	33	1.20	23	1.10	18
15.....	1.70	69	1.35	33	1.20	23	1.00	14
16.....	1.70	69	1.35	33	1.20	23	1.10	18
17.....	1.68	66	1.35	33	1.22	24	1.10	18
18.....	1.60	56	1.37	34	1.20	23	1.10	18
19.....	1.70	69	1.35	33	1.20	23	1.10	18
20.....	1.75	77	1.35	33	1.20	23	1.10	18
21.....	1.73	74	1.31	30	1.18	22	1.10	18
22.....	1.65	62	1.30	29	1.20	23	1.10	18
23.....	1.59	55	1.30	29	1.20	23	1.10	18
24.....	1.59	55	1.32	30	1.20	23	1.10	18
25.....	1.55	51	1.30	29	1.20	23	1.10	18
26.....	1.53	48	1.33	31	1.19	22	1.10	18
27.....	1.53	48	1.30	29	1.15	20	1.10	18
28.....	1.52	47	1.30	29	1.10	18	1.09	18
29.....	1.52	47	1.30	29	1.10	18	1.09	18
30.....	1.53	48	1.27	27	1.13	20	1.05	16
31.....			1.26	27			1.05	16

## MONTHLY DISCHARGE of Bath Creek near Lake Louise, for 1915.

(Drainage area 30 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (23 to 31).....	69	45	57	1 900	0.64	1,025
June.....	415	54	127	4 233	4.72	7,557
July.....	320	164	237	7 900	9.11	14,573
August.....	373	241	323	1 077	1.24	19,860
September.....	231	47	98	3 267	3.64	5,831
October.....	54	27	35	1 167	1.34	2,152
November.....	29	18	24	0 800	0.89	1,428
December.....	19	14	18	0 600	0.69	1,107
The period.....					22.27	53,533

## BOW RIVER AT LAKE LOUISE.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 28, Tp. 28, Rge. 16, W. 5th Mer., one-half mile east of Lake Louise station, at the junction of the Bow and Pipestone Rivers.

*Records available.*—January 1, 1911, to December 31, 1915. In 1910 discharge measurements only.

*Gauge.*—Chain. Elevation of zero maintained at 4,931.72 feet since establishment. Previous to September 1, 1911, gauge at old station was used.

*Bench-mark.*—Permanent iron bench-mark on the left bank. Elevation, 4,942.82 feet above mean sea level. (Canadian Pacific Railway datum.)

*Channel.*—Permanent.

*Discharge measurements.*—Made from a cable or by wading.

## SESSIONAL PAPER No. 25c

*Floods.*—During the latter part of June, 1915, stream was in flood. The highest gauge height recorded was 9.54 feet on June 26, 1915. Stream did not overflow banks.

*Observer.*—E. Braund.

## DISCHARGE MEASUREMENTS of Bow River at Lake Louise, in 1915.

Date.	Engineer.	Width.		Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.		Feet.		Sq. ft.
Jan. 12	H. C. Ritchie	50.0	42.2	1.34	5.43	450	2
Jan. 29	do	50.0	40.1	1.05	4.85	421	1
Feb. 9	do	50.0	42.0	1.14	5.19	48.6	
Feb. 23	do	50.0	37.6	1.12	5.51	42.1	
Mar. 9	do	50.0	33.0	1.24	5.36	41.0	
Mar. 23	do	43.5	29.2	1.44	4.27	42	0
April 6	do	43.5	40.8	1.78	4.50	72.0	
April 20	O. H. Hoover	55.5	98.4	2.69	5.81	265.0	
May 13	H. C. Ritchie	69.0	138.7	3.54	6.4	400.0	
May 26	do	67.0	134.5	3.19	6.39	470.0	
June 9	do	68.0	139.3	3.41	6.36	475.0	
June 23	do	72.0	183.1	3.76	6.99	689.0	
July 20	do	74.0	251.6	4.34	7.46	1,014.0	
Aug. 18	do	74.0	269.9	5.36	7.92	1,445.0	
Sept. 1	do	73.5	222.0	4.60	7.23	1,022.0	
Sept. 30	do	58.0	95.5	1.92	5.42	184.0	
Oct. 20	do	51.0	80.2	1.76	5.14	141.0	
Nov. 2	do	49.0	74.5	1.95	5.15	145.0	
Nov. 17	J. E. Caughey	45.0	66.3	1.34	5.24	89.0	
Dec. 3	do	43.0	84.4	1.32	6.23	111.0	
Dec. 15	H. C. Ritchie	54.0	52.0	1.75	7.15	6	

Ice conditions Jan. 1 to Mar. 22.

Ice conditions Nov. 17 to Dec. 31.

## DAILY GAUGE HEIGHT AND DISCHARGE of Bow River at Lake Louise, for 1915.

DAY.	January.		February.		March.		April.		May		June	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5.24	60	4.81	47	5.17	40	4.20	44	5.80	278	6.36	450
2	5.24	61	4.87	47	5.36	41	4.26	49	5.74	264	6.35	447
3	5.24	60	4.93	47	5.24	42	4.34	74	5.68	250	6.24	430
4	5.24	57	4.94	48	5.08	41	4.53	73	5.65	248	6.27	428
5	5.24	55	5.03	48	5.04	40	4.42	62	5.63	219	6.36	450
6	5.24	55	4.84	48	5.27	41	4.46	66	5.68	230	6.34	444
7	5.24	56	4.95	48	5.34	41	4.54	74	5.82	282	6.31	439
8	5.24	57	4.76	49	5.29	41	4.54	74	6.19	393	6.30	430
9	5.24	57	4.88	49	5.34	41	4.45	65	6.54	319	6.26	426
10	5.24	57	5.24	49	5.34	41	4.36	57	6.68	379	6.25	419
11	5.24	57	5.20	49	4.85	41	4.47	67	6.65	366	6.14	379
12	5.43	56	5.19	48	4.41	41	4.31	71	6.46	387	6.10	367
13	5.25	51	5.20	46	4.45	41	4.75	96	6.40	464	6.24	410
14	5.31	50	5.66	42	4.72	41	4.81	101	6.24	418	6.18	407
15	5.16	50	5.77	44	4.63	41	4.94	120	6.10	363	6.01	360
16	5.13	51	5.67	46	4.23	41	5.06	137	5.96	321	6.24	360
17	5.17	53	5.16	46	4.25	42	5.32	178	5.86	284	7.16	792
18	5.16	54	5.13	46	4.25	42	5.46	205	5.80	278	7.01	740
19	5.05	53	5.71	46	4.23	42	5.60	232	5.79	260	6.85	608
20	5.05	48	5.21	45	4.19	42	5.84	280	5.72	235	6.74	600
21	4.84	43	5.30	42	4.20	44	5.64	241	5.81	281	6.72	590
22	5.03	41	5.41	42	4.25	49	5.50	211	6.00	307	6.72	590
23	5.05	41	5.51	42	4.27	50	5.48	202	6.04	344	6.46	543
24	4.98	41	5.20	42	4.21	43	5.50	211	6.14	379	6.09	520
25	4.90	40	5.31	43	4.30	52	5.47	203	6.24	410	7.02	710
26	4.83	40	5.07	42	4.34	55	5.46	204	6.29	406	6.41	538
27	4.81	40	4.96	42	4.50	70	5.44	200	6.30	407	6.74	570
28	4.80	41	5.37	41	4.45	65	5.35	184	6.08	357	6.40	519
29	4.75	42			4.32	54	5.31	177	6.11	348	6.06	510
30	4.76	45			4.18	42	5.30	169	6.00	332	5.82	500
31	4.85	46			4.73	46			5.15	353		

a to b Gauge heights frozen to bottom  
a Gauge heights interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of Bow River at Lake Louise, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	8.05	1,529	7.64	1,160	7.23	1,012	5.64	241	5.18	155	5.79	106
2.....	7.73	1,236	7.75	1,254	7.13	960	5.57	226	5.16	152	6.03	110
3.....	7.60	1,126	7.88	1,368	7.04	920	5.52	215	5.16	152	6.23	111
4.....	7.64	1,160	7.90	1,386	7.05	932	5.43	198	5.12	146	6.21	110
5.....	7.76	1,262	7.68	1,193	6.98	900	5.46	203	5.06	137	6.18	110
6.....	7.84	1,333	7.63	1,151	6.91	868	5.37	187	4.89	113	6.27	109
7.....	7.92	1,405	7.64	1,160	6.72	780	5.27	170	5.01	130	6.47	106
8.....	7.86	1,350	7.64	1,160	6.53	762	5.27	170	5.04	134	6.39	102
9.....	7.74	1,245	7.64	1,160	6.37	608	5.22	161	4.95	121	6.77	99
10.....	7.55	1,088	7.63	1,151	6.17	520	5.16	132	4.84	107	7.11	97
11.....	7.28	902	7.57	1,103	6.03	468	5.12	146	4.71	91	7.39	95
12.....	7.05	763	7.57	1,103	5.92	432	5.12	146	4.67	87	7.48	93
13.....	6.95	708	7.54	1,080	5.83	404	5.09	142	4.66	86	7.39	92
14.....	7.45	1,015	7.62	1,143	5.74	376	5.10	143	4.90	89	7.32	91
15.....	7.35	947	7.64	1,160	5.66	348	5.03	132	5.11	89	7.15	91
16.....	7.55	1,088	7.67	1,185	5.68	356	5.02	131	5.21	89	6.85	90
17.....	7.55	1,088	7.64	1,160	5.60	332	5.00	128	5.23	89	6.70	89
18.....	7.45	1,015	7.75a	1,264	5.54	316	5.07	138	5.24	89	6.68	90
19.....	7.45	1,015	7.63	1,176	5.75	376	5.14	149	5.24	89	6.57	88
20.....	7.43	1,001	8.43	1,736	5.64	340	5.16	152	5.24	88	6.34	87
21.....	7.54	1,080	7.84	1,400	5.56	312	5.16	152	5.13	89	6.22	86
22.....	7.73	1,236	7.75	1,324	5.54	304	5.16	152	5.25	90	6.08	85
23.....	7.61	1,134	7.70	1,296	5.63	320	5.08	140	5.24	91	6.01	84
24.....	7.44	1,008	7.74	1,360	5.58	304	5.08	140	5.16	92	5.75	84
25.....	7.45	1,015	7.63	1,260	5.51	272	5.07	138	5.15	93	5.65	84
26.....	7.48	1,036	7.54	1,200	5.46	252	5.04	134	5.05	95	5.80	83
27.....	7.33	935	7.52	1,192	5.46	240	5.23	163	5.05	96	5.94	83
28.....	7.74	1,245	7.44	1,140	5.42	220	5.36	185	5.06	99	5.88	82
29.....	7.53	1,073	7.44	1,152	5.37	192	5.27	170	5.29	101	5.77	81
30.....	7.59	1,118	7.46	1,176	5.42a	184	5.26	168	5.66	103	5.90	81
31.....	7.64	1,160	7.44	1,168	.....	.....	5.22	161	.....	.....	5.98	80

a-a Aug. 18 to Sept. 30 Bolster method.

Ice conditions Jan. 1 to Mar. 22.

Ice conditions Nov. 17 to Dec. 31.

## MONTHLY DISCHARGE of Bow River at Lake Louise, for 1915.

(Drainage area 165 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	61	40	50	0.303	0.35	3,074
February.....	49	41	46	0.279	0.29	2,555
March.....	70	40	45	0.273	0.32	2,767
April.....	319	44	144	0.873	0.97	8,569
May.....	579	239	355	2.150	2.48	21,828
June.....	2,985	363	796	4.820	5.38	47,365
July.....	1,529	708	1,107	6.710	7.74	68,070
August.....	1,736	1,080	1,223	7.410	8.54	75,200
September.....	1,012	184	483	2.930	3.27	28,740
October.....	241	128	162	0.983	1.13	9,961
November.....	155	86	106	0.642	0.72	6,307
December.....	111	80	93	0.564	0.65	5,718
The year.....	.....	.....	.....	.....	31.84	280,154

## PIPESTONE RIVER AT LAKE LOUISE.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 27, Tp. 28, Rge. 16, W. 5th Mer., one-half mile east of Lake Louise station at the junction of the Bow and Pipestone Rivers.

*Records available.*—September 1, 1911, to October 31, 1911; January 1, 1912, to December 31, 1915.

*Gauge.*—Chain. Elevation of zero maintained at 4,985.04 feet since establishment.



## SESSIONAL PAPER No. 25c

*Bench-mark.*—Permanent iron bench-mark on left bank. Elevation, 4,993.73 feet above mean sea level. (Canadian Pacific Railway datum.)

*Channel.*—Small boulders and gravel. High water may shift some boulders at times.

*Discharge measurements.*—Made from a cable or by wading.

*Floods.*—Stream was in flood during June, 1915. Maximum gauge height, 7.47 feet. Stream did not overflow banks.

*Observer.*—E. Braund.

## DISCHARGE MEASUREMENTS of Pipestone River at Lake Louise, in 1915.

Date.	Engineer.	Width.	Area of Section	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 11.	H. C. Ritchie	41.0	37.6	1.26	4.88	47.4
Jan. 26.	do	40.0	29.4	0.95	4.42	28.0
Feb. 8.	do	35.0	25.8	1.12	4.70	28.8
Feb. 23.	do	35.0	28.0	1.13	4.18	24.7
Mar. 9.	do	35.0	55.5	0.56	4.73	31.0
Mar. 23.	do	40.0	32.4	1.03	4.00	34.0
April 6.	do	41.5	30.2	0.97	3.94	30.0
April 20.	O. H. Hoover	64.5	85.7	2.78	4.92	238.0
May 13.	H. C. Ritchie	73.0	101.0	3.06	5.15	309.0
May 26.	do	73.5	106.9	3.19	5.18	341.0
June 9.	do	73.5	103.2	3.20	5.20	331.0
June 23.	do	75.0	132.0	4.09	5.59	540.0
July 20.	do	76.5	144.4	4.35	5.84	628.0
Aug. 19.	do	75.0	121.2	4.24	5.67	514.0
Sept. 1.	do	73.5	97.2	3.10	5.24	301.0
Sept. 30.	do	61.5	62.4	2.03	4.61	128.0
Oct. 20.	do	58.5	56.8	1.87	4.53	106.0
Nov. 2.	do	56.0	45.4	1.66	4.41	75.0
Nov. 17.	J. E. Caughey	67.0	88.3	0.80	5.71	71.0
Dec. 4.	do	68.0	98.6	0.43	6.05	42.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Pipestone River near Lake Louise, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	5.72	47a	4.38	26	4.06	28	3.90	26	4.82	183	5.23	325
2	5.69	47	4.39	27	4.08	28	3.96	31	4.74	161	5.21	317
3	5.69	47	4.33	28	4.12	29	4.15	51	4.69	149	5.10	274
4	5.54	46	4.33	29	4.10	30a	4.15	51	4.67	144	5.14	290
5	5.42	44	4.29	30	4.03	38	4.11	46	4.67	144	5.25	333
6	5.23	43	4.36	32	4.03	38	3.94	30	4.72	156	5.18	305
7	5.14	45	4.72	33	4.01	36	4.07	42	4.88	199	5.32	363
8	5.13	46	4.60	29	4.02	37	4.13	40	5.28	346	5.34	372
9	5.13	47	4.53	27	4.02	37	4.04	39	5.47	433	5.20	313
10	5.12	48	4.40	26	4.03	38	3.91	27	5.56	479	5.12	282
11	4.92	48	4.34	25	4.01	36	4.07	42	5.53	464	4.99	235
12	4.83	49	4.32	25	3.98	33	4.17	53	5.16	297	4.99	235
13	4.72	49	4.28	25	3.98	33	4.28	68	5.15	294	5.11	278
14	4.63	50	4.38	25	4.01	36	4.31	73	5.00	238	5.18	305
15	4.62	50	4.34	25	4.02	37	4.38	84	4.89	202	5.34	372
16	4.56	51	4.31	26	3.97	32	4.52	109	4.80	177	5.47	433
17	4.58	52	4.15	27	3.97	32	4.63	134	4.77	169	5.69	547
18	4.53	52	4.13	28	3.99	34	4.72	156	4.74	161	5.60	500
19	4.49	52	4.16	28	3.97	32	4.81	180	4.70	151	5.40	299
20	4.43	52	4.14	26	3.94	30	4.86	194	4.72	156	5.38	390
21	4.29	49	4.25	25	3.94	30	4.66	146	4.85	191	5.32	363
22	4.43	42	4.22	25	3.98	33	4.56	118	5.04	252	5.40	399
23	4.43	36	4.18	25	4.01	36	4.53	112	5.01	242	5.36	479
24	4.43	32	4.22	25	3.95	30	4.58	123	5.12	282	5.60	500
25	4.42	30	4.22	26	3.92	28	4.57	120	5.15	294	5.93	678
26	4.43	28	4.26	26	3.89	25	4.57	120	5.18	303	7.47	1,568
27	4.39	26	4.20	27	4.20	57	4.56	118	5.06	260	6.57	1,046
28	4.34	25	4.14	27	3.99	34	4.47	100	4.96	225	6.23	848
29	4.31	26			3.93	29	4.50	125	4.98	231	6.10	774
30	4.34	26			3.99	34	5.06	260	4.96	225	6.04	740
31	4.34	26			3.99	34			5.03	249		

a-a Ice conditions Jan. 1 to March 4.

DAILY GAUGE HEIGHT AND DISCHARGE of Pipestone River near Lake Louise, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	6.10	774	5.65	526	5.24	329	4.78	172	4.51	107	6.14	48
2.	5.86	639	5.74	574	5.21	317	4.71	154	4.41	89	6.12	46
3.	5.80	606	5.75	579	5.11	278	4.69	149	4.42	91	6.12	44
4.	5.80	606	5.75	579	5.11	278	4.62	132	4.44	94	6.08	42
5.	5.90	661	5.59	495	5.10	274	4.64	137	4.44	94	5.90	40
6.	5.90	661	5.54	469	5.07	263	4.60	127	4.22	60	5.95	39
7.	5.91	667	5.54	469	5.04	252	4.51	107	4.25	64	5.84	38
8.	5.85	634	5.58	490	4.98	231	4.61	129	4.30	71	5.80	37
9.	5.80	606	5.53	464	4.91	208	4.56	118	4.44	94	5.67	37
10.	5.62	510	5.53	464	4.86	194	4.53	112	4.29	70	5.50	36
11.	5.51	453	5.49	443	4.79	174	4.50	105	4.23	61	5.89	35
12.	5.33	368	5.51	453	4.76	167	4.50	105	4.36	83	5.94	34
13.	5.32	363	5.47	433	4.71	154	4.50	105	4.40	87	5.84	34
14.	5.74	574	5.50	448	4.71	154	4.52	109	5.00a	71	5.86	33
15.	5.58	490	5.51	453	4.70	151	4.47	100	5.40	74	5.75	33
16.	5.75	579	5.53	464	4.70	151	4.47	100	5.58	72	5.66	32
17.	5.83	622	5.51	453	4.70	151	4.50	105	5.71	71	5.65	31
18.	5.74	574	5.55	474	4.64	137	4.52	109	5.79	70	5.56	31
19.	5.76	584	5.53	464	4.80	177	4.53	112	5.99	68	5.36	30
20.	5.74	574	6.41	953	4.70	151	4.54	114	6.09	66	5.18	30
21.	5.80	606	5.88	650	4.70	151	4.53	112	6.18	64	5.04	29
22.	5.86	639	5.61	505	4.66	141	4.53	112	6.20	63	4.95	29
23.	5.81	612	5.60	500	4.77	169	4.49	103	6.21	61	4.95	29
24.	5.66	531	5.57	484	4.73	159	4.53	112	6.20	59	4.91	29
25.	5.68	542	5.50	448	4.69	149	4.53	112	6.21	58	4.66	28
26.	5.68	542	5.41	404	4.66	141	4.50	105	6.19	56	4.61	27
27.	5.57	484	5.40	399	4.68	146	4.57	120	6.21	55	4.56	26
28.	5.98	706	5.33	368	4.67	144	4.62	132	6.23	53	4.56	25
29.	5.66	531	5.32	363	4.63	134	4.55	116	6.21	51	4.38	25
30.	5.73	568	5.32	363	4.63	134	4.55	116	6.21	50	4.46	24
31.	5.74	574	5.31	358			4.53	112			4.46	24b

a-b Ice conditions.

## MONTHLY DISCHARGE of Pipestone River near Lake Louise, for 1915.

(Drainage area 137 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.	52	25	42	0.307	0.35	2,582
February.	33	25	27	0.197	0.20	1,500
March.	57	25	34	0.248	0.29	2,091
April.	260	26	94	0.686	0.76	5,593
May....	479	144	241	1.760	2.03	14,819
June.	1,568	235	475	3.470	3.87	28,264
July.	774	363	577	4.210	4.85	35,478
August.	953	358	484	3.530	4.07	29,760
September.	329	134	189	1.380	1.54	11,246
October.	172	100	118	0.861	0.99	7,256
November.	107	50	71	0.518	0.58	4,225
December.	48	24	33	0.241	0.28	2,029
The year.					19.81	144,843

## SESSIONAL PAPER No. 25c

## LOUISE CREEK NEAR LAKE LOUISE.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 20, Tp. 28, Rge. 16, W. 5th Mer., at the Chateau Lake Louise, 500 feet from the lake itself.

*Records available.*—July 11, 1913, to December 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 93.72 feet to June 9, 1915, from establishment. Zero elevation maintained at 90.63 feet from June 9, 1915, to December 31, 1915.

*Bench-mark.*—Spikes in tree on left bank about 15 feet below gauge rod. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made by wading.

*Diversions.*—The penstock of the Lake Louise power plant takes water from the lake, and this quantity must be added to the discharge of Louise Creek to obtain the total run-off from the lake.

*Floods.*—The stream reached highest gauge height August 16 from the warm weather in that locality. The flood period of June on the Louise Creek was not extensive.

*Observer.*—Stephen F. Toolsey, January 1 to 16; David Grieg, January 17 to May 15; David Smith, May 16 to November 15; J. Talerico, November 16 to December 31.

## DISCHARGE MEASUREMENTS of Louise Creek near Lake Louise, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 11.	H. C. Ritchie	10.8	4.59	1.46	4.05	6.68
Jan. 28.	do	8.6	2.97	0.89	3.92	2.65
Feb. 8.	do	8.4	2.82	0.63	3.89	1.79
Feb. 24.	do	8.0	2.80	0.56	3.88	1.62
Mar. 10.	do	8.0	2.80	0.56	3.87	1.57
Mar. 24.	do	7.0	2.35	0.66	3.87	1.54
April 22.	O. H. Hoover.	10.3	3.50	1.43	4.00	5.00
May 13.	H. C. Ritchie	22.0	14.95	0.98	4.22	14.70
May 26.	do	12.0	5.00	2.03	4.14	10.20
June 9.	do	22.8	16.00	1.00	4.27	16.00
June 23.	do	22.0	20.20	1.67	4.45	34.50
July 20.	do	24.0	26.40	2.65	4.78	79.00
Aug. 18.	do	47.4	47.01	2.39	5.12	113.00
Sept. 2.	do	47.0	32.30	2.39	4.80	77.00
Oct. 1.	do	4.5	1.15	0.97	3.85	1.11
Oct. 20.	do	11.0	3.90	1.76	4.05	6.00
Nov. 2.	do	11.0	3.90	1.74	4.05	6.80
Nov. 18.	J. E. Caughey	4.6	1.39	0.90	3.93	1.28
Dec. 4.	do	5.0	1.30	0.33	3.84	0.44
Dec. 16.	H. C. Ritchie				3.82	0.30

*a* Discharge estimated.

*b* Gauge height ice conditions.

## DAILY GAUGE HEIGHT AND DISCHARGE OF Louise Creek near Lake Louise, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.09	8.6	3.94	3.30	3.87	1.58	3.87	1.58	4.06	7.20	4.14	10.9
2.....	4.09	8.6	3.94	3.30	3.87	1.58	3.87	1.58	4.08	8.10	4.20	14.0
3.....	4.09	8.6	3.91	2.60	3.86	1.34	3.88	1.82	4.08	8.10	4.25	16.8
4.....	4.09	8.6	3.91	2.60	3.86	1.34	3.88	1.82	4.10	9.00	4.26	17.4
5.....	4.09	8.6	3.90	2.30	3.85	1.10	3.88	1.82	4.11	9.50	4.26	17.4
6.....	4.14	10.9	3.89	2.70	3.86	1.34	3.90	2.30	4.12	10.00	4.28	18.7
7.....	4.09	8.6	3.89	2.10	3.86	1.34	3.90	2.30	4.13	10.40	4.28	18.7
8.....	4.06	7.2	3.89	2.10	3.87	1.58	3.88	1.82	4.14	10.90	4.26	17.4
9.....	4.06	7.2	3.89	2.10	3.87	1.58	3.88	1.82	4.15	11.40	4.25	16.8
10.....	4.06	7.2	3.89	2.10	3.87	1.58	3.88	1.82	4.16	11.90	4.24	16.2
11.....	4.05	6.8	3.88	1.82	3.86	1.34	3.89	2.10	4.18	13.00	4.24	16.2
12.....	4.04	6.4	3.88	1.82	3.87	1.58	3.89	2.10	4.20	14.00	4.25	16.8
13.....	4.05	6.8	3.88	1.82	3.87	1.58	3.90	2.30	4.22	15.10	4.26	17.4
14.....	4.04	6.4	3.90	2.30	3.88	1.82	3.90	2.30	4.22	15.10	4.26	17.4
15.....	4.04	6.4	3.90	2.30	3.89	2.10	3.91	2.60	4.21	14.60	4.28	18.7
16.....	4.06	7.2	3.87	1.58	3.89	2.10	3.92	2.80	4.20	14.00	4.28	18.7
17.....	4.04	6.4	3.86	1.34	3.88	1.82	3.92	2.80	4.18	13.00	4.32	21.6
18.....	3.96	3.9	3.85	1.10	3.88	1.82	3.94	3.30	4.18	13.00	4.38	27.0
19.....	3.94	3.3	3.85	1.10	3.86	1.34	3.96	3.90	4.17	12.40	4.38	27.0
20.....	3.94	3.3	3.86	1.34	3.86	1.34	3.98	4.40	4.16	11.90	4.39	28.0
21.....	3.94	3.3	3.86	1.34	3.86	1.34	3.99	4.70	4.15	11.40	4.38	27.0
22.....	3.99	4.7	3.87	1.58	3.87	1.58	4.00	5.00	4.15	11.40	4.40	28.0
23.....	3.96	3.9	3.88	1.82	3.87	1.58	4.02	5.70	4.14	10.90	4.43	31.0
24.....	3.94	3.3	3.88	1.82	3.87	1.58	4.03	6.10	4.14	10.90	4.44	32.0
25.....	3.92	2.8	3.88	1.82	3.88	1.82	4.03	6.10	4.13	10.40	4.46	35.0
26.....	3.92	2.8	3.88	1.82	3.89	2.10	4.03	6.10	4.13	10.40	4.85	81.0
27.....	3.92	2.8	3.86	1.34	3.88	1.82	4.04	6.40	4.14	10.90	4.70	63.0
28.....	3.92	2.8	3.86	1.34	3.88	1.82	4.04	6.40	4.14	10.90	4.70	63.0
29.....	3.92	2.8	.....	.....	3.87	1.58	4.05	6.80	4.17	12.40	4.70	63.0
30.....	3.94	3.3	.....	.....	3.86	1.34	4.05	6.80	4.17	12.40	4.70	63.0
31.....	3.92	2.8	.....	.....	3.86	1.34	.....	.....	4.18	13.00	.....	.....

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Louise Creek near Lake Louise, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.69	62	5.03	103	4.89	86.0	3.86	1.34	4.06	7.20	3.88	1.82
2.....	4.68	61	5.04	104	4.87	83.0	4.05	6.80	4.05	6.50	3.85	1.82
3.....	4.68	61	5.09	110	4.82	77.0	4.06	7.20	4.04	6.40	3.84	0.96
4.....	4.68	61	5.08	109	4.82	77.0	4.06	7.20	4.03	6.10	3.83	0.82
5.....	4.66	58	5.03	103	4.82	77.0	4.06	7.20	4.02	5.70	3.82	0.68
6.....	4.68	61	5.02	101	4.82	77.0	4.07	7.70	4.02	5.70	3.82	0.68
7.....	4.70	63	5.05	105	4.68	61.0	4.08	8.10	4.00	5.00	3.83	0.82
8.....	4.70	63	5.06	106	4.64	56.0	4.10	9.00	3.98	4.40	3.81	0.54
9.....	4.69	62	5.06	106	4.62	53.0	4.09	8.60	3.98	4.40	3.81	0.54
10.....	4.68	61	5.06	106	4.55	45.0	4.09	8.60	3.97	4.20	3.85	1.10
11.....	4.66	58	5.06	106	4.48	37.0	4.04	6.40	3.96	3.90	3.84	0.96
12.....	4.66	58	5.03	103	4.42	30.0	4.00	5.00	3.95	3.60	3.84	0.96
13.....	4.64	56	5.04	104	4.40	28.0	4.00	5.00	3.94	3.30	3.84	0.96
14.....	4.70	63	5.06	106	4.38	27.0	4.01	5.40	3.94	3.30	3.84	0.96
15.....	4.66	58	5.10	111	4.38	27.0	4.01	5.40	3.92	2.50	3.83	0.82
16.....	4.67	59	5.12	113	4.38	27.0	4.02	5.70	3.92	2.80	3.83	0.82
17.....	4.69	62	5.12	113	4.38	27.0	4.02	5.70	3.93	3.10	3.81	0.54
18.....	4.70	63	5.10	110	4.38	27.0	4.04	6.40	3.93	3.10	3.81	0.54
19.....	4.78	73	5.06	106	4.36	25.0	4.04	6.40	3.93	3.10	3.79	0.35
20.....	4.80	75	5.02	101	4.37	26.0	4.05	6.80	3.92	2.80	3.79	0.35
21.....	4.79	74	4.98	97	4.34	23.0	4.05	6.80	3.90	2.30	3.79	0.35
22.....	4.78	73	4.98	97	4.30	20.0	4.05	6.80	3.92	2.80	3.79	0.35
23.....	4.80	75	5.02	101	4.30	20.0	4.04	6.40	3.91	2.60	3.78	0.30
24.....	4.80	75	5.02	101	4.29	19.4	4.04	6.40	3.90	2.30	3.78	0.30
25.....	4.79	74	4.98	97	4.28	18.7	4.03	6.10	3.90	2.30	3.78	0.30
26.....	4.78	73	4.96	94	4.26	17.4	4.04	6.40	3.89	2.10	3.78	0.30
27.....	4.79	74	4.98	97	4.26	17.4	4.04	6.40	3.88	1.82	3.78	0.30
28.....	4.82	77	4.98	97	4.25	16.8	4.04	6.40	3.88	1.82	3.78	0.30
29.....	4.84	80	4.96	94	4.25	16.8	4.04	6.40	3.88	1.82	3.78	0.30
30.....	4.86	82	4.96	94	4.25	16.8	4.04	6.40	3.87	1.58	3.78	0.30
31.....	4.98	97	4.96	94	.....	.....	4.05	6.80	.....	.....	3.78	0.30

## MONTHLY DISCHARGE of Louise Creek near Lake Louise, for 1915.

(Drainage area 11 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	10.9	2.80	5.7	0.518	0.60	350
February.....	3.3	1.10	1.93	0.175	0.18	107
March.....	2.1	1.10	1.58	0.144	0.17	97
April.....	6.8	1.58	3.57	0.324	0.36	212
May.....	15.1	7.20	11.60	1.05	1.21	713
June.....	81.0	10.90	29.00	2.64	2.94	1,776
July.....	97.0	56.00	67.00	6.09	7.02	4,120
August.....	113.0	94.00	103.00	9.36	10.79	6,333
September.....	86.0	16.80	39.00	3.54	3.93	2,321
October.....	9.0	1.34	6.50	0.591	0.68	400
November.....	7.2	1.58	3.60	0.327	0.36	214
December.....	1.8	0.30	0.66	0.060	0.07	41
The year.....	.....	.....	.....	.....	38.33	16,634

## FORTYMILE CREEK NEAR BANFF.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 2, Tp. 26, Rge. 12, W. 5th Mer., near the Canadian Pacific Railway station at Banff and one mile from the mouth of the stream.

*Records available.*—Aug. 1, 1912, to Dec. 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero, 91 43 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on right bank. Assumed elevation, 100 00 feet.

*Channel.*—Clay and gravel.

*Discharge measurements.*—Made from a bridge, wading when low.

*Flood.*—The stream was in flood June 26, 1915, maximum gauge height, 6.60, stream did not overflow its banks; high water caused from excessive rain of June 25.

*Observer.*—Peter Petersen.

# DISCHARGE MEASUREMENTS of Fortymile Creek near Banff, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 14.	H. C. Ritchie.	25.0	38.0	0.38	2.44	22.2
Jan. 30.	do	23.0	29.2	0.58	2.89	16.9
Feb. 13.	do	25.0	34.6	0.68	2.37	23.7
Feb. 20.	do	25.0	32.5	0.60	2.31	19.4
Mar. 4.	do	24.5	31.0	0.45	2.27	14.1
Mar. 22.	do	25.0	30.8	0.52	2.30	16.0
April 5.	do	25.0	33.4	0.64	2.34	21.0
April 24.	O. H. Hoover.	26.0	41.4	1.28	2.67	53.0
May 7.	H. C. Ritchie.	29.0	53.0	1.66	2.90	88.0
May 25.	do	29.5	51.9	1.71	3.08	89.0
June 12.	do	29.5	54.4	1.80	3.16	98.0
June 21.	do	32.0	73.1	2.16	3.84	158.0
July 1.	do	32.0	144.2	3.10	6.19	447.0
July 22.	do	32.0	97.6	2.39	4.62	233.0
Aug. 9.	do	31.0	66.6	1.93	3.58	129.0
Aug. 28.	do	29.0	55.8	1.64	3.19	91.0
Sept. 25.	do	29.5	48.4	1.60	2.98	77.0
Oct. 19.	do	28.5	45.2	1.41	2.79	64.0
Nov. 1.	do	27.0	41.8	1.29	2.73	54.0
Nov. 19.	J. E. Caughey.	29.0	42.2	1.14	2.67	48.0
Nov. 27.	do	24.0	19.9	1.52	2.67	30.0
Dec. 10.	do	19.0	14.3	1.37	2.45	19.7
Dec. 27.	H. C. Ritchie.	24.0	12.3	1.24	2.38	15.2

Winter conditions Nov. 19 to Dec. 31.

# DAILY GAUGE HEIGHT AND DISCHARGE of Fortymile Creek near Banff, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	2.48	32.0	2.48a	19.0	2.30	16.5	2.30	16.5	2.81	60	3.21	94
2.	2.42	27.0	2.46	19.5	2.28	14.8	2.29	15.6	2.80	59	3.32	104
3.	2.45	30.0	2.35	21.0	2.28	14.8	2.31	17.4	2.79	58	3.28	100
4.	2.48	32.0	2.34	19.9	2.29	15.6	2.33	19.0	2.79	58	3.21	94
5.	2.40	25.0	2.33	19.0	2.30	16.5	2.31	17.4	2.78	57	3.33	105
6.	2.70	50.0	2.33	19.0	2.26	13.1	2.31	17.4	2.77	56	3.27	99
7.	2.50	34.0	2.32	18.2	2.27	14.0	2.30	16.5	2.85	67	3.32	104
8.	2.50	34.0	2.34	19.9	2.26	13.1	2.34	19.9	2.94	71	3.38	100
9.	2.48	32.0	2.34	19.9	2.27	14.0	2.35	21.0	3.24	97	3.42	113
10.	2.49	33.0	2.34	19.9	2.27	14.0	2.34	19.9	3.36	107	3.44	115
11.	2.48	32.0	2.35	21.0	2.27	14.0	2.36	22.0	3.23	96	3.43	114
12.	2.46	30.0	2.35	21.0	2.28	14.8	2.35	21.0	3.18	91	3.15	89
13.	2.35	21.0	2.35	21.0	2.27	14.0	2.37	22.0	3.16	90	3.19	92
14.	2.33	19.0	2.74	54.0	2.26	13.1	2.39	24.0	3.09	84	3.22	95
15.	2.35	21.0	2.38	23.0	2.26	13.1	2.41	26.0	3.05	80	3.36	107
16.	2.50	34.0	2.36	22.0	2.27	14.0	2.46	30.0	2.98	74	3.52	122
17.	2.38	23.0	2.35	21.0	2.27	14.0	2.52	35.0	2.97	73	4.02	169
18.	2.48	32.0	2.35	21.0	2.29	15.6	2.56	39.0	2.93	70	4.01	168
19.	2.48	32.0	2.37	22.0	2.28	14.8	2.66	47.0	2.88	67	3.99	166
20.	2.35	21.0	2.33	19.0	2.27	14.0	2.72	52.0	2.84	62	3.90	157
21.	2.50	34.0	2.34	19.9	2.30	16.5	2.74	54.0	2.88	67	3.84	151
22.	2.48	32.0	2.34	19.9	2.30	16.5	2.74	54.0	2.90	68	3.89	156
23.	2.49	33.0	2.33	19.0	2.30	16.5	2.68	49.0	2.97	73	4.04	171
24.	2.47	31.0	2.29	15.6	2.31	17.4	2.68	49.0	2.97	73	4.23	190
25.	2.34	19.9	2.29	15.6	2.30	16.5	2.67	48.0	3.09	84	4.67	239
26.	2.51a	14.0	2.29	15.6	2.41	26.0	2.69	50.0	3.09	84	6.60	508
27.	2.58a	14.2	2.31	17.4	2.35	21.0	2.67	48.0	3.08	83	6.29	462
28.	2.55a	15.0	2.28	14.8	2.30	16.5	2.65	46.0	3.14	88	6.26	457
29.	2.88a	16.0			2.28	14.8	2.63	43.0	3.23	96	6.08	430
30.	2.86a	16.9			2.30	16.5	2.79	58.0	3.19	92	6.07	428
31.	2.68a	17.5			2.29	15.6			3.20	93		

a Ice conditions Jan. 26 to Feb. 1.

## SESSIONAL PAPER No. 25

DAILY GAUGE HEIGHT AND DISCHARGE of Fortymile Creek near Banff, for 1915.—*Concluded.*

DAY	July.		August.		September.		October.		November.		December	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.01	420	4.01	168	3.10	84	2.90	68	2.71	51	2.47	27
2.....	5.58	356	3.99	166	3.12	86	2.90	68	2.72	52	2.48	26
3.....	5.15	298	3.94	161	3.10	84	2.90	68	2.72	52	2.66	24
4.....	5.03	283	3.84	151	3.11	85	2.89	67	2.72	52	2.79	24
5.....	5.14	297	3.71	139	3.06	81	2.90	68	2.70	50	2.74	23
6.....	5.04	284	3.67	135	3.04	79	2.90	68	2.68	49	2.70	22
7.....	4.98	276	3.61	130	3.05	80	2.90	68	2.68	49	2.69	22
8.....	4.79	253	3.52	122	3.00	76	2.90	68	2.74	54	2.71	21
9.....	4.57	228	3.49	119	2.98	74	2.89	67	2.74	54	2.70	20
10.....	4.47	217	3.48	118	2.97	73	2.86	64	2.76	56	2.45	20
11.....	4.19	186	3.44	115	2.94	71	2.83	62	2.67	48	2.44	19
12.....	4.01	168	3.41	112	2.93	70	2.85	63	2.61	43	2.70	19
13.....	3.87	154	3.32	104	2.91	68	2.84	62	2.47	31	2.44	18
14.....	4.27	195	3.26	98	2.89	67	2.84	62	2.47	31	2.46	18
15.....	4.31	199	3.28	100	2.88	67	2.82	61	2.74	54	2.42	18
16.....	4.48	218	3.29	101	2.87	65	2.80	59	2.80	59	2.40	17
17.....	4.71	243	3.35	106	2.87	65	2.79	58	2.92	69	2.39	17
18.....	4.68	240	3.44	115	2.87	65	2.80	59	2.73	53	2.41	17
19.....	4.64	235	3.49	119	2.88	67	2.79	58	2.71	48	2.43	16
20.....	4.58	229	3.50	120	2.90	68	2.78	57	2.73	47	2.44	16
21.....	4.59	230	3.45	115	2.92	69	2.77	56	2.47	46	2.63	16
22.....	4.52	222	3.38	109	2.93	70	2.75	55	2.71	44	2.61	16
23.....	4.37	206	3.39	110	2.97	73	2.75	55	2.72	42	2.52	16
24.....	4.24	191	3.34	106	2.97	73	2.75	55	2.70	39	2.40	15
25.....	4.13	180	3.28	100	2.94	71	2.74	54	2.71	36	2.38	15
26.....	4.03	170	3.24	97	2.93	70	2.74	54	2.74	32	2.43	15
27.....	3.98	165	3.19	92	2.92	69	2.78	57	2.67	30	2.38	15
28.....	4.07	174	3.19	92	2.91	68	2.75	55	2.42	29	2.36	16
29.....	4.04	171	3.10	84	2.90	68	2.75	55	2.43	28	2.37	16
30.....	4.00	167	3.11	85	2.90	68	2.75	55	2.47	27	3.18	16
31.....	4.02	169	3.10	84	.....	.....	2.74	54	.....	.....	2.98	17

a Ice conditions Nov. 19 to Dec. 31.

## MONTHLY DISCHARGE of Fortymile Creek, near Banff, for 1915.

(Drainage area 62 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
January.....	50	14.0	27.0	0.435	0.50	1,660
February.....	54	14.8	20.0	0.322	0.34	1,111
March.....	26	13.1	15.5	0.250	0.29	958
April.....	58	15.6	33.0	0.532	0.59	1,960
May.....	107	56.0	77.0	1.24	1.43	4,704
June.....	508	89.0	184.0	2.970	3.31	10,949
July.....	420	154.0	227.0	3.660	4.22	13,958
August.....	168	84.0	115.0	1.850	2.13	7,071
September.....	86	65.0	72.0	1.160	1.29	4,284
October.....	68	54.0	61.0	0.984	1.13	3,781
November.....	69	27.0	45.0	0.726	0.81	2,678
December.....	27	15.0	18.6	0.300	0.35	1,144
The year.....					21.95	84,517



## BOW RIVER AT BANFF.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 35, Tp. 25, Rge. 12, 'W. 5th Mer., at the highway bridge at Banff.

*Records available.*—May 25, 1909, to November 11, 1909. April 26, 1910, to December 31, 1915.

*Gauge.*—Chain gauge on bridge. Elevation of zero maintained at 92.04 feet during 1909–12. Elevation of zero maintained at 93.21 feet during 1913. Elevation of zero maintained at 93.06 feet during 1914. Elevation of zero maintained at 87.23 feet during 1915.

*Bench-mark.*—Permanent iron bench-mark on right bank. Assumed elevation, 100.00 feet. This bench-mark is at datum 99.68 feet referred to the old bench-mark now destroyed.

*Channel.*—Permanent, bed of stream gravel and boulders.

*Discharge measurements.*—Made from a bridge, which has been moved 75 feet downstream during the year.

*Winter flow.*—This station is entirely free from the back water effect of ice, and one discharge curve is used throughout the year.

*Flood.*—The stream was in flood June 27, maximum gauge height, 10.33 feet and discharge 8,335 sec.-ft.; stream did not overflow banks.

*Observer.*—N. B. Sanson.

## DISCHARGE MEASUREMENTS of Bow River at Banff, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 16.....	H. C. Ritchie.....	55.5	132.0	2.45	6.07	324.0
Feb. 12.....	do.....	55.5	130.0	2.29	6.24	296.0
Feb. 19.....	do.....	54.5	123.0	2.28	6.10	281.0
Mar. 8.....	do.....	66.0	131.0	1.95	5.99	256.0
Mar. 20.....	do.....	78.0	134.0	2.08	6.05	280.0
April 3.....	do.....	94.0	158.0	2.28	6.20	360.0
April 19.....	O. H. Hoover.....	191.5	330.6	2.93	7.32	970.0
May 12.....	H. C. Ritchie.....	335.0	694.4	2.91	8.11	2,022.0
May 29.....	do.....	334.0	715.6	3.06	8.16	2,194.0
June 11.....	do.....	334.0	660.1	2.86	7.94	1,889.0
June 28.....	do.....	369.0	1,401.0	5.32	10.07	7,450.0
July 2.....	do.....	364.0	1,243.0	4.59	9.58	5,709.0
July 12.....	do.....	361.0	959.2	3.55	8.79	3,402.0
July 19.....	do.....	363.0	1,135.1	4.03	9.24	4,577.0
Aug. 14.....	do.....	362.0	953.9	3.44	8.74	3,284.0
Aug. 30.....	do.....	355.0	879.6	3.19	8.57	2,803.0
Oct. 5.....	do.....	329.0	496.7	2.11	7.35	1,046.0
Oct. 22.....	do.....	239.0	359.2	2.15	7.10	771.0
Nov. 4.....	do.....	234.5	332.6	2.06	7.02	685.0
Nov. 15.....	J. E. Caughy.....	123.0	228.1	2.40	6.75	550.0
Nov. 30.....	do.....	128.0	243.6	2.08	6.60	509.0
Dec. 11.....	do.....	115.0	230.6	2.06	6.46	477.0
Dec. 29.....	H. C. Ritchie.....	73.0	157.0	2.38	6.33	374.0

## SESSIONAL PAPER No. 25c

## DAILY GAUGE HEIGHT AND DISCHARGE of Bow River at Banff, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.30 <sup>a</sup>	335	5.99	258	6.04	268	6.06	272	7.62	1,326	8.08	1,998
2.....	6.28 <sup>a</sup>	329	5.97	255	5.98	257	6.06	272	7.69	1,417	8.17	2,152
3.....	6.31 <sup>a</sup>	338	5.98	257	6.00	260	6.18	300	7.37	1,034	8.10	2,030
4.....	6.28 <sup>a</sup>	329	5.96	254	6.01	262	6.27	326	7.37	1,034	8.10	2,030
5.....	6.24 <sup>a</sup>	317	5.93	249	6.01	262	6.25	320	7.35	1,012	8.17	2,152
6.....	6.22 <sup>a</sup>	311	5.96	254	5.98	257	6.25	320	7.40	1,065	8.16 <sup>a</sup>	2,135
7.....	6.25 <sup>a</sup>	320	5.96 <sup>a</sup>	254	5.99 <sup>a</sup>	258	6.27	326	7.56	1,252	8.14 <sup>a</sup>	2,100
8.....	6.26 <sup>a</sup>	323	5.98	257	6.00	260	6.34	347	7.92	1,746	8.10 <sup>a</sup>	2,030
9.....	6.27	326	5.99	258	6.06	272	6.27	326	8.22	2,242	8.09 <sup>a</sup>	2,014
10.....	6.22	311	6.06	272	6.00	260	6.24	317	8.35	2,485	8.05	1,950
11.....	6.21	308	6.10	280	6.00	260	6.28 <sup>a</sup>	329	8.29	2,372	7.94	1,777
12.....	6.19	303	6.15	292	6.02	264	6.31	338	8.07	1,952	7.92	1,746
13.....	6.12	285	6.24	317	6.00	260	6.38	359	8.03	1,918	7.96 <sup>a</sup>	1,808
14.....	6.09	278	6.26 <sup>a</sup>	323	6.20	305	6.51	404	7.94	1,777	8.05	1,950
15.....	6.08	276	6.24 <sup>a</sup>	317	6.03	266	6.57	432	7.80	1,570	8.18	2,170
16.....	6.06	272	6.20 <sup>a</sup>	305	6.04	268	6.69	494	7.70 <sup>a</sup>	1,430	8.33	2,447
17.....	6.12	285	6.16 <sup>a</sup>	295	6.01	262	6.82	572	7.61	1,313	8.71	3,212
18.....	6.14	290	6.06 <sup>a</sup>	272	6.01	262	7.09	762	7.54	1,228	8.70	3,190
19.....	6.11	282	6.10	280	6.02	264	7.25	910	7.50	1,180	8.61	3,001
20.....	6.11	282	6.11	282	6.04	268	7.27	930	7.46	1,134	8.61	3,001
21.....	5.96	254	6.11 <sup>a</sup>	282	6.06 <sup>a</sup>	272	7.38	1,044	7.51	1,192	8.50	2,780
22.....	5.95	253	6.11	282	6.10	280	7.12	788	7.62	1,326	8.52	2,820
23.....	6.00	260	6.11	282	6.16	295	7.12	788	7.70 <sup>a</sup>	1,430	8.67	3,127
24.....	6.00 <sup>a</sup>	260	6.07	274	6.10	280	7.10	770	7.83	1,614	8.77	3,344
25.....	5.99	258	6.08	276	5.95	253	7.08 <sup>a</sup>	754	7.87	1,672	9.07	4,109
26.....	6.00	260	6.09	278	5.90	245	7.07	746	7.97	1,823	10.14	7,670
27.....	5.90	245	6.08	276	5.95	253	7.08	754	7.91	1,731	10.33	8,335
28.....	5.93 <sup>a</sup>	249	6.07 <sup>a</sup>	274	6.00 <sup>a</sup>	260	7.00	690	7.99	1,854	9.97	7,075
29.....	5.96	254	.....	.....	6.06	272	7.03	714	8.17	2,152	9.81	6,515
30.....	5.97	255	.....	.....	6.03	266	7.50	1,180	8.14	2,100	9.76	6,340
31.....	5.98	257	.....	.....	6.05	270	.....	.....	7.98	1,839	.....	.....

<sup>a</sup> Gauge heights interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE OF BOW RIVER at Banff, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1. ....	9.79	6,445	9.08	4,136	8.56	2,900	7.43	1,099	7.14	806	6.48	452
2. ....	9.62	5,850	9.10	4,190	8.46	2,700	7.46	1,134	7.06	738	6.42	428
3. ....	9.32	4,834	9.12	4,246	8.38	2,542	7.42	1,008	7.11	778	6.58	492
4. ....	9.34a	4,898	9.09	4,163	8.34	2,466	7.39	1,055	7.02	706	6.70	540
5. ....	9.36	4,962	8.98	3,868	8.28	2,353	7.38	1,044	7.05	730	6.66a	524
6. ....	9.47	5,328	8.93	3,738	8.32	2,428	7.35	1,012	6.81	585	6.63	512
7. ....	9.38	5,026	8.90	3,660	8.21	2,223	7.29	950	6.78a	572	6.60	500
8. ....	9.30	4,770	8.90	3,660	8.02	1,902	7.26	920	6.75	560	6.60	500
9. ....	9.23	4,560	8.92	3,712	8.09	2,014	7.25	910	6.83	595	6.61	504
10. ....	9.15	4,330	8.85	3,535	7.86	1,657	7.21a	870	6.73	552	6.45	440
11. ....	8.90a	3,660	8.75	3,300	7.75	1,500	7.18	842	6.61	504	6.46	444
12. ....	8.70	3,190	8.79	3,388	7.71	1,444	7.15	815	6.52	468	6.47a	448
13. ....	8.67	3,127	8.75	3,300	7.63	1,339	7.15	815	6.43	432	6.48	452
14. ....	8.89	3,635	8.74	3,278	7.57	1,264	7.14	806	6.59a	496	6.53	472
15. ....	9.05	4,055	8.81	3,435	7.54	1,228	7.10	770	6.76	564	6.45	440
16. ....	9.20a	4,470	8.84	3,510	7.51	1,192	7.10	770	6.79	576	6.40	420
17. ....	9.32	4,834	8.74	3,278	7.48	1,157	7.08a	754	6.80	580	6.44	456
18. ....	9.23	4,560	8.89	3,635	7.44	1,111	7.06	738	6.78	572	6.46	444
19. ....	9.25	4,620	8.95	3,790	7.56	1,252	7.13	842	6.79	576	6.46a	444
20. ....	9.21a	4,500	9.01	3,947	7.59	1,288	7.15	815	6.77	568	6.46	444
21. ....	9.18	4,414	8.95	3,790	7.53	1,216	7.14	806	6.72a	548	6.47a	448
22. ....	9.18	4,414	8.84	3,510	7.46	1,134	7.13	797	6.67	528	6.49	456
23. ....	9.19	4,442	8.87	3,585	7.49	1,168	7.12	788	6.76	564	6.43	432
24. ....	8.98	3,868	8.83	3,485	7.56	1,252	7.12a	788	6.71	544	6.39	416
25. ....	8.97	3,842	8.79	3,388	7.44	1,111	7.11	779	6.67	528	6.45	440
26. ....	8.94	3,764	8.75	3,300	7.42	1,088	7.10	770	6.69	536	6.34a	396
27. ....	8.89	3,635	8.78	3,256	7.40	1,065	7.16	824	6.66	524	6.23	352
28. ....	9.07	4,109	8.66	3,106	7.41	1,077	7.16	824	6.58a	492	6.42	428
29. ....	9.05	4,055	8.59	2,960	7.36	1,023	7.20	860	6.50	460	6.32	358
30. ....	9.04a	4,028	8.63	3,043	7.34	1,002	7.19	851	6.60b	500	6.23	352
31. ....	9.03	4,001	8.65	3,085	.....	.....	7.17a	833	.....	.....	6.26	364

a Gauge heights interpolated.

b Used gauge height from meter gauging taken.

Nov. 1-Dec. 31 Curve No. 2.

## MONTHLY DISCHARGE of Bow River at Banff, for 1915.

(Drainage area 890 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January. ....	338	245	287	0.322	0.37	17,647
February. ....	323	249	277	0.311	0.32	15,384
March. ....	305	245	266	0.299	0.34	16,356
April. ....	1,180	272	553	0.621	0.69	32,906
May. ....	2,485	1,012	1,589	1.780	2.05	97,700
June. ....	8,335	1,746	3,234	3.630	4.05	192,436
July. ....	6,445	3,127	4,394	4.940	5.70	270,170
August. ....	4,246	2,960	3,557	4.000	4.61	218,710
September. ....	2,900	1,002	1,570	1.760	1.96	93,420
October. ....	1,134	738	870	0.978	1.13	53,494
November. ....	806	375	548	0.616	0.69	32,608
December. ....	540	352	445	0.500	0.58	27,362
The year. ....	.....	.....	.....	.....	22.49	1,068,193

## SESSIONAL PAPER No. 25c

## SPRAY RIVER NEAR SPRAY LAKES.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 31, Tp. 22, Rge. 10, W. 5th Mer.

*Records available.*—July 23 to October 27, 1914, and June 9 to October 17, 1915.

*Gauge.*—Chain gauge on right bank.

*Bench-mark.*—On tree. Elevation, 11.48 feet above the zero of the gauge.

*Channel.*—Permanent.

*Discharge measurements.*—Made by wading. Cable station installed above gauge September 15, 1915.

*Observer.*—Louis Mumford.

*Remarks.*—Insufficient discharge measurements have been made to accurately determine the daily discharge. The installation of the cable station will enable gaugings to be made during the period of summer floods.

## DISCHARGE MEASUREMENTS of Spray River near Spray Lakes, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Sept. 15.....	H. C. Ritchie.....	79.5	132.5	1.77	5.63	234

## DAILY GAUGE HEIGHT, IN FEET, of Spray River near Spray Lakes, for 1915.

DAY.	June.	July.	August.	September.	October.
1.....		8.13	6.45		
2.....					
3.....		8.11	6.45		
4.....					
5.....		8.13	6.39		5.50
6.....					
7.....		8.15	6.32		5.50
8.....				5.76	5.49
9.....	7.13	8.19	6.30	5.74	
10.....				5.68	
11.....	7.11	8.24	6.27	5.67	5.47
12.....				5.68	
13.....	7.13	8.23	6.23	5.68	5.45
14.....				5.67	
15.....	7.30	8.29	6.18	5.63	5.43
16.....					
17.....	7.50	8.24	6.16	5.60	5.41
18.....				5.59	
19.....	7.62		6.15	5.59	
20.....					
21.....	7.61		6.13	5.58	
22.....					
23.....	7.63		6.08	5.57	
24.....				5.57	
25.....	7.66		6.03	5.56	
26.....					
27.....	8.06	6.51	6.02	5.55	
28.....					
29.....	8.21				
30.....		6.47		5.54	
31.....					

## SPRAY CREEK AT SPRAY LAKES.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 32, Tp. 22, Rge. 10, W. 5th Mer.

*Records available.*—July 23 to October 27, 1914, and June 9 to October 17, 1915.

*Gauge.*—Vertical staff at left bank.

*Bench-mark.*—On tree. Elevation, 4.98 feet above the zero of gauge.

*Channel.*—Permanent.

*Discharge measurements.*—Made by wading.

*Observer.*—Louis Mumford.

## DISCHARGE MEASUREMENTS of Spray Creek at Spray Lakes, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
July 27.....	H. C. Ritchie.....	37.6	57.4	3.46	1.91	199.0
July 28.....	do .....	37.6	57.6	3.51	1.93	202.0
Sept. 15.....	do .....	35.1	33.2	2.04	0.91	68.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Spray Creek at Spray Lakes, for 1915.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.90	516	1.98	209	1.20a	99	0.94a	70
2.....			3.85a	508	1.98a	209	1.18a	97	0.93a	69
3.....			3.80	500	1.99	210	1.16a	94	0.92a	68
4.....			3.83a	505	1.94a	203	1.14a	92	0.91a	67
5.....			3.85	508	1.90	197	1.11a	88	0.90	66
6.....			3.84a	506	1.85a	190	1.09a	86	0.85	62
7.....			3.84	506	1.80	182	1.07a	84	0.82a	59
8.....			3.84a	506	1.76a	176	1.05	82	0.79	56
9.....	1.35	117	3.84	506	1.72	170	1.04a	80	0.79a	56
10.....	1.35a	117	3.82a	503	1.66a	161	1.04	80	0.78a	55
11.....	1.34	116	3.84a	506	1.60	152	1.00	76	0.78	55
12.....	1.50a	137	3.86a	510	1.53a	141	0.97	73	0.78a	55
13.....	1.63	156	3.84	506	1.45	131	0.95	71	0.77	55
14.....	1.74a	173	3.85a	508	1.43a	128	0.93	69	0.77a	55
15.....	1.85	190	3.86	510	1.40	124	0.92	68	0.76	54
16.....	1.94a	203	3.83a	505	1.40a	124	0.92a	68	0.76a	54
17.....	2.02	215	3.80	500	1.39	123	0.91	67	0.75	53
18.....	2.02a	215	3.84a	506	1.47a	133	0.92a	68		
19.....	2.02	215	3.72a	487	1.56	146	0.94	70		
20.....	2.08a	225	3.78a	497	1.56a	146	0.94a	70		
21.....	2.12	231	3.64a	474	1.55	145	0.95	71		
22.....	2.21a	246	3.30a	420	1.49a	136	0.95a	71		
23.....	2.30	260	3.06a	382	1.43	128	0.95	71		
24.....	2.33a	265	2.76a	330	1.37a	120	0.95a	71		
25.....	2.35	268	2.40a	276	1.30	111	0.96	72		
26.....	2.70a	324	2.22a	247	1.28a	109	0.95a	71		
27.....	3.05	380	2.07a	223	1.25	105	0.94	70		
28.....	3.60a	468	1.93	201	1.25a	105	0.94a	70		
29.....	3.95	594	1.97a	207	1.24	104	0.94a	70		
30.....	3.92a	519	2.00	212	1.22a	101	0.94	70		
31.....			2.00a	212	1.21a	100				

a Gauge heights interpolated.

## MONTHLY DISCHARGE of Spray Creek at Spray Lakes, for 1915.

(Drainage area 35 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (9-30).....	524	116	253	7.229	5.91	11,040
July.....	516	201	428	12.229	14.10	26,317
August.....	210	100	146	4.171	4.81	8,977
September.....	99	67	76	2.171	2.42	4,522
October (1-17).....	70	53	59	1.686	1.07	1,989
The period.....					28.31	52,845

## SESSIONAL PAPER No. 25c

## SPRAY RIVER NEAR BANFF.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 25, Tp. 25, Rge. 12, W. 5th Mer., at the highway bridge near the Canadian Pacific Railway Banff Springs Hotel, near the junction of the stream with the Bow River.

*Records available.*—July 15, 1910, to December 31, 1915.

*Gauge.*—Chain on left bank. Elevation of zero maintained at 93.29 feet during 1910-11. Elevation of zero maintained at 88.71 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark on the left bank. Assumed elevation, 100.00 feet.

*Channel.*—Permanent, gravel; large boulders at left bank pier.

*Discharge measurements.*—Made from a bridge.

*Floods.*—Maximum gauge height, June 26, 7.55 feet; stream in flood June 26 to end of month.

*Observer.*—N. B. Sanson.

## DISCHARGE MEASUREMENTS of Spray River near Banff, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 22.....	H. C. Ritchie.....	27.5	68.2	2.63	5.46	179
Mar. 5.....	do .....	27.5	59.0	3.02	5.33	179
Mar. 22.....	do .....	38.5	57.8	3.01	4.65	174
April 5.....	do .....	39.5	57.2	3.10	4.66	177
April 21.....	O. H. Hoover.....	102.5	114.6	3.51	5.37	402
May 10.....	H. C. Ritchie.....	117.5	205.6	4.61	6.15	948
May 28.....	do .....	117.5	174.2	4.28	5.96	747
June 8.....	do .....	117.5	196.8	4.77	6.19	939
June 21.....	do .....	118.5	212.6	5.29	6.40	1,135
July 3.....	do .....	121.5	288.0	6.36	7.20	1,843
July 10.....	do .....	120.5	268.3	5.88	6.97	1,579
July 22.....	do .....	119.5	253.6	5.33	6.75	1,352
Aug. 9.....	do .....	118.0	216.0	4.05	6.40	995
Aug. 28.....	do .....	117.5	174.5	4.03	6.05	704
Oct. 4.....	do .....	113.5	127.6	3.31	5.52	423
Oct. 23.....	do .....	92.5	98.6	3.20	5.25	315
Nov. 5.....	do .....	89.5	96.2	3.33	5.20	320
Nov. 16.....	J. E. Caughey.....	35.5	90.5	2.98	5.15	268
Nov. 30.....	do .....	34.5	82.0	2.56	5.05	210
Dec. 11.....	do .....	40.5	70.3	2.90	4.90	204
Dec. 28.....	H. C. Ritchie.....	32.5	68.6	2.56	5.09	176

## DAILY GAUGE HEIGHT AND DISCHARGE of Spray River near Banff, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.ft</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	7.80a	192	7.48	167	5.16	181	4.59	163	5.71	573	6.09	849
2.....	7.68a	198	6.95	170	5.10	182	4.65	176	5.66a	543	6.22	962
3.....	7.70a	197	7.03	173	5.48	181	4.71	189	5.61	513	6.19	935
4.....	7.62a	194	6.67	176	5.24	180	4.70a	187	5.60	507	6.16	909
5.....	7.50a	191	6.46	179	5.33	179	4.70	187	5.57	491	6.02	791
6.....	7.56a	188	6.45	181	5.05	177	4.69	185	5.56	486	5.98a	760
7.....	7.62a	190	6.32a	185	5.15a	177	4.72	192	5.76	605	6.04a	808
8.....	7.50a	193	6.24	187	5.32	178	4.71	189	5.89	693	6.04a	808
9.....	7.45a	195	6.07	188	5.36	179	4.71	189	6.00a	775	6.06a	824
10.....	7.52a	197	6.03	189	5.51	176	4.70	187	6.16	909	6.11	866
11.....	7.38a	196	5.84	187	5.64	175	4.73a	194	6.09	849	6.03	800
12.....	7.40a	195	5.64	185	5.38	175	4.78	205	6.02	791	6.00	775
13.....	7.46	190	5.86	180	5.45	176	4.78	205	6.02	791	6.03a	800
14.....	7.50	185	5.79a	175	5.46a	174	4.84	220	5.97	752	6.06	824
15.....	7.78	180	5.73	175	5.47	171	4.86	225	5.89	693	6.14	892
16.....	7.43	178	5.70	174	5.29	171	4.93	243	5.82a	644	6.25	988
17.....	7.30	177	5.74	176	5.27	175	5.01	265	5.78	617	6.50	1,226
18.....	9.05	178	5.57	178	5.69	176	5.12a	301	5.74	592	6.47	1,196
19.....	8.38	181	5.57	179	4.70	187	5.28	357	5.72	580	6.45	1,177
20.....	7.71	185	5.49	179	4.61	167	5.37	394	5.66	543	6.44a	1,167
21.....	6.95	185	5.40a	180	4.62a	169	5.41	412	5.69	561	6.43	1,157
22.....	6.84	184	5.31	179	4.64	174	5.29	361	5.77	611	6.47	1,196
23.....	7.01	180	5.35	179	4.65	176	5.33	378	5.82a	644	6.54	1,266
24.....	6.90a	175	5.17	179	4.63	172	5.33	378	5.87	679	6.73	1,459
25.....	6.74	169	5.30	178	4.59	163	5.30a	365	5.91	708	6.90	1,636
26.....	6.97	105	5.38	178	4.56	158	5.29	361	5.97	752	7.55	2,300
27.....	6.84	163	5.26	179	4.50	148	5.28	357	5.96	745	7.45	2,180
28.....	6.65a	162	5.20a	179	4.52	151	5.26	350	6.03	800	7.42	2,135
29.....	6.49	163	.....	.....	4.60	165	5.28	357	6.10	857	7.44	2,135
30.....	6.87	164	.....	.....	4.59	163	5.62	519	6.05a	816	7.38	2,055
31.....	7.15a	165	.....	.....	4.60	165	.....	.....	6.03	800	.....	.....

Jan. 1 to Mar. 18, winter conditions.

a Interpolated gauge height June 26 to July 3.



## SESSIONAL PAPER No 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Spray River near Banff, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	7.42	2.085	6.66	1,259	6.06	712	5.53	426	5.27	329	5.00	209
2.	7.20	1,843	6.65	1,249	6.03	691	5.53	426	5.25	322	5.14	209
3.	7.12	1,741	6.65	1,249	5.97	651	5.52a	421	5.26	326	5.31	208
4.	7.12a	1,741	6.64	1,239	5.93	626	5.52	421	5.22	313	5.27	208
5.	7.13	1,752	6.55	1,147	5.92a	620	5.56	438	5.20	306	5.62a	207
6.	7.06	1,678	6.45	1,047	5.91	613	5.50	413	5.07	269	4.97	207
7.	7.12	1,741	6.46	1,056	5.87	590	5.46	397	5.01a	253	4.93	206
8.	7.10	1,720	6.43	1,027	5.84	574	5.43	386	4.96	240	4.93	206
9.	7.06	1,678	6.46	1,056	5.82	563	5.42	382	5.08	272	4.96	205
10.	7.05	1,667	6.39	987	5.75	526	5.42	382	5.04	261	4.83	205
11.	6.90a	1,508	6.32	921	5.73	516	5.40	374	4.94	236	4.90	204
12.	6.63	1,229	6.32	921	5.70a	500	5.37	363	4.89	224	4.88a	197
13.	6.59	1,188	6.33	930	5.65	477	5.36	360	4.92	231	4.85	195
14.	6.74	1,341	6.33	930	5.61	459	5.35	357	5.03a	258	4.98	192
15.	6.75	1,352	6.24	851	5.60	455	5.31	343	5.15	292	4.95	191
16.	6.77	1,372	6.26	868	5.58	447	5.30	339	5.05	264	5.04	190
17.	6.83	1,435	6.22	834	5.56	438	5.29	336	4.91b	263	5.04	190
18.	6.80a	1,403	6.24	851	5.55	434	5.27	329	4.93	260	5.15	191
19.	6.80	1,403	6.22	834	5.60a	455	5.33	349	4.94	256	5.20a	193
20.	6.79a	1,393	6.33	930	5.62	464	5.31	343	4.94	252	5.26	194
21.	6.77	1,372	6.26	868	5.62	464	5.30	339	4.97a	248	4.89	194
22.	6.75	1,352	6.26	868	5.59	451	5.30	339	5.00	243	4.91	192
23.	6.76	1,362	6.23	843	5.62	464	5.27	329	4.90	238	4.87	189
24.	6.65	1,249	6.21	825	5.58	447	5.27	329	4.89	235	4.99	184
25.	6.63	1,229	6.19	809	5.56	438	5.27	329	4.90	231	5.06	179
26.	6.80	1,403	6.16	786	5.55a	434	5.29	336	4.89	227	5.00	173
27.	6.68	1,280	6.10	740	5.53	426	5.28	332	4.87	223	5.09	173
28.	6.73	1,331	6.07	719	5.54	430	5.33	349	4.88a	218	5.05	176
29.	6.70	1,300	6.03	691	5.55	434	5.30	339	4.90	214	5.02	176
30.	6.73	1,331	6.06	712	5.48	405	5.32	346	5.05	210	4.89	176
31.	6.70	1,300	6.10	740	.....	.....	5.30a	339	.....	.....	4.88c	177

a Interpolated gauge height.

b-c Winter conditions.

## MONTHLY DISCHARGE of Spray River near Banff, for 1915.

(Drainage area 295 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	198	162	182	0.617	0.71	11,191
February.....	189	167	179	0.607	0.63	9,941
March.....	187	148	172	0.583	0.67	10,576
April.....	519	163	276	0.936	1.04	16,423
May.....	909	486	675	2.290	2.64	41,564
June.....	2,300	760	1,196	4.050	4.52	71,166
July.....	2,085	1,188	1,477	5.010	5.78	90,820
August.....	1,259	691	929	3.130	3.63	37,172
September.....	712	405	567	1.720	1.92	20,160
October.....	426	329	364	1.300	1.42	22,881
November.....	329	210	267	0.871	0.97	15,285
December.....	200	173	193	0.654	0.75	11,867
The year.....					24.68	388,447

## CASCADE RIVER AT BANKHEAD.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 19, Tp. 26, Rge. 11, W. 5th Mer., at the Bankhead mines.

*Records available.*—Aug. 16, 1911, to December 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero maintained at 93.49 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on right bank. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent, shifted during floods in June, 1915.

*Discharge measurements.*—Made from foot bridge to time of flood, since then, by wading owing to bridge being destroyed.

*Artificial control.*—This station is two and one-half miles below the reservoir of the Calgary Power Company at Lake Minnewanka near Bankhead mines water supply and the flow of the stream is controlled by the gates.

*Floods.*—Maximum gauge height June 26, 4.02 feet and June 28, 4.66 feet. Flood was on June 26, but owing to control at Lake Minnewanka being overlooked, the highest water was on June 28, when several stop logs at the control had to be blasted out with dynamite. This caused a rush of water in Cascade river and enlarged the stream bed in many places, including the gauging section. In some places the stream overflowed the banks.

*Observer.*—J. B. Mackinlay, Jan. 1 to July 31; W. E. Cowan, Aug. 31 to December 31.

## DISCHARGE MEASUREMENTS of Cascade River at Bankhead, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 14	H. C. Ritchie	42.0	54.2	2.28	1.10	124
Jan. 30	do	42.2	65.3	3.22	1.37	210
Feb. 5	do	42.2	60.6	2.86	1.26	173
Feb. 26	do	44.0	91.0	4.29	2.07	389
Mar. 11	do	43.0	82.0	3.52	1.72	290
Mar. 25	do	44.0	86.6	4.96	1.99	430
April 10	do	42.8	74.4	3.70	1.50	276
April 16	do	42.5	61.6	2.57	1.26	158
April 27	O. H. Hoover	42.3	57.5	2.89	1.23	166
May 11	H. C. Ritchie	41.5	37.3	1.28	0.74	48
May 28	do	40.8	30.5	1.04	0.57	32
June 10	do	44.8	94.2	4.98	2.24	469
June 22	do	46.6	132.2	7.12	2.92	941
Aug. 13	do	94.0	158.9	5.00	2.62	794
Aug. 31	do	84.0	109.5	3.72	2.15	408
Oct. 6	do	89.5	73.7	2.64	1.74	194
Oct. 19	do	54.0	97.9	1.87	1.72	183
Nov. 3	do	55.0	98.2	2.08	1.84	204
Nov. 16	J. E. Caughey	79.0	124.7	1.98	1.90	247
Dec. 1	do	70.0	113.5	1.75	1.63	198
Dec. 13	do	74.0	103.0	1.73	1.60	179
Dec. 31	H. C. Ritchie	61.0	110.0	1.52	2.51	168

Winter conditions Dec. 5-31.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Cascade River at Bankhead, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.15	142	1.31	182	1.95	395	1.66	289	0.85	77.0	0.71	51
2.....	1.12	135	1.33	187	1.96	399	1.60	269	0.85	77.0	0.92	90
3.....	1.12	135	1.29	176	2.14	476	1.57	260	0.85	77.0	1.04	116
4.....	1.15	142	1.27	171	2.02	424	1.85	356	0.85	77.0	1.42	213
5.....	1.15	142	1.26	169	1.91	379	1.79	333	0.85	77.0	1.44	219
6.....	1.15	142	1.24	163	1.80	337	1.72	309	0.88	82.0	1.56	257
7.....	1.10	130	1.23	161	2.09	454	1.65	285	0.50	20.0	1.67	292
8.....	1.05	119	1.22	158	2.00	415	1.58	263	0.68	45.0	1.93	287
9.....	1.11	132	1.21	156	1.88	367	1.55	254	0.98	103.0	2.26	532
10.....	1.13	137	1.18	148	1.79	333	1.53	247	1.18	148.0	2.24	522
11.....	1.11	132	1.18	148	1.72	309	1.42	213	0.74	56.0	2.28	541
12.....	1.15	142	1.17	146	1.65	285	1.38	201	0.90	86.0	2.32	561
13.....	1.12	135	1.17	146	1.83	348	1.35	193	1.01	109.0	2.38	592
14.....	1.10	130	1.64	282	2.09	454	1.31	182	1.25	166.0	2.42	613
15.....	1.10	130	1.60	269	1.99	411	1.30	179	0.56	27.0	2.46	634
16.....	1.08	125	1.55	254	1.89	371	1.25	166	0.66	42.0	2.48	645
17.....	1.05	119	1.81	341	1.82	345	1.27	171	0.70	49.0	2.59	708
18.....	1.05	119	1.67	292	1.76	323	1.27	171	0.81	69.0	2.92	939
19.....	1.07	123	1.63	279	2.05	437	1.31	182	0.54	24.0	2.97	979
20.....	1.10	130	1.58	263	1.85	356	1.29	176	0.68	45.0	2.97	979
21.....	1.10	130	1.95	395	2.02	424	1.37	199	0.43	13.0	2.95	963
22.....	1.05	119	1.86	360	1.93	387	1.35	193	0.44	14.0	2.95	963
23.....	1.09	128	1.78	330	1.84	352	1.33	187	0.31	5.5	2.99	995
24.....	1.96	399	2.20	503	2.09	454	1.30	179	0.57	28.0	3.03	1,028
25.....	1.54	250	2.13	472	1.99	411	1.27	171	0.63	36.0	3.05	1,044
26.....	1.51	241	2.06	441	1.90	375	1.24	163	0.70	49.0	4.02	1,854
27.....	1.45	223	1.97	403	1.82	345	1.23	161	0.39	9.5	3.63	1,728
28.....	1.43	216	2.09	454	2.03	328	1.25	166	0.57	28.0	4.66	2,607
29.....	1.40	207	.....	.....	1.94	391	1.26	169	0.68	45.0	3.87	1,956
30.....	1.37	199	.....	.....	1.82	345	1.38	201	0.80	67.0	4.32	2,384
31.....	1.33	187	.....	.....	1.76	323	.....	.....	0.56	27.0	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Cascade River at Bankhead, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.20	2,270	3.04	1,168	2.15	411	1.67	165	1.85	242	1.65	157
2.....	4.20	2,270	3.04	1,168	2.19	437	1.65	157	1.85	242	1.64	154
3.....	4.10	2,175	3.05	1,178	2.24	472	1.68	169	1.85	242	1.63	150
4.....	4.00	2,080	3.02	1,149	2.00	318	1.68	169	1.81	223	1.61	143
5.....	3.88	1,966	2.99	1,121	1.99	313	1.74	193	1.84	237	1.61a	145
6.....	3.77	1,861	2.80	950	2.00	318	1.75	197	1.83	232	1.62	147
7.....	3.74	1,833	2.68	842	2.01	324	1.76	201	1.83	232	1.61	150
8.....	3.69	1,785	2.65	815	2.05	348	1.69	172	1.83	232	1.61	152
9.....	3.59	1,690	2.77	923	2.05	348	1.69	172	1.82	227	1.63	155
10.....	3.15	1,273	2.72	878	2.06	354	1.69	172	1.83	232	1.82	164
11.....	3.15	1,273	2.70	860	2.04	342	1.69	172	1.82	227	1.63	171
12.....	3.10	1,225	2.70	860	2.04	342	1.69	172	1.89	260	1.62	177
13.....	3.05	1,178	2.61	780	1.62	146	1.70	176	1.86	246	1.61	179
14.....	3.04	1,168	2.62	789	1.58	132	1.70	176	1.85	242	1.61	178
15.....	3.03	1,158	2.56	736	1.59	136	1.70	176	1.94	286	1.60	178
16.....	3.03	1,158	2.55	727	1.59	136	1.70	176	1.89	260	1.60	178
17.....	3.05	1,178	2.83	977	1.58	132	1.71	180	1.89	260	1.60	178
18.....	3.08	1,206	2.74	896	1.59	136	1.71	180	1.87	251	1.60	176
19.....	3.13	1,253	2.74	896	1.63	150	1.71	180	1.88	256	1.59	175
20.....	3.14	1,263	3.05	1,178	1.65	157	1.86	246	1.86	246	1.59	175
21.....	3.15	1,273	3.05	1,178	1.67	165	1.86	246	1.82	227	1.59	175
22.....	3.15	1,273	1.94	286	1.71	180	1.85	242	1.85	242	1.59	174
23.....	3.15	1,273	2.04	342	1.61	143	1.85	242	1.84	237	1.59	173
24.....	3.15	1,273	2.05	348	1.61	143	1.85	242	1.84	237	1.59	170
25.....	3.12	1,244	2.08	366	1.63	150	1.84	237	1.81	223	1.59	170
26.....	3.15	1,273	2.05	348	1.64	154	1.84	237	1.81	223	1.78	172
27.....	3.10	1,225	2.09	372	1.75	197	1.84	237	1.83	232	1.75	180
28.....	3.05	1,178	2.10	378	1.64	154	1.85	242	1.83	232	1.61	180
29.....	3.04	1,168	2.11	385	1.65	157	1.85	242	1.77	205	1.80	160
30.....	3.04	1,168	2.11	385	1.65	157	1.85	242	1.78	210	2.32	152
31.....	3.02	1,149	2.14	404	.....	.....	1.86	246	.....	.....	2.59b	168

a-b Winter conditions.

## MONTHLY DISCHARGE of Cascade River at Bankhead, for 1915.

(Drainage area 244 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	399	119.0	159	0.652	0.75	9,777
February.....	503	146.0	266	1.090	1.14	14,773
March.....	476	285.0	379	1.550	1.79	23,304
April.....	356	161.0	216	0.885	0.99	12,853
May.....	166	5.5	57	0.234	0.27	3,505
June.....	2,607	51.0	843	3.460	3.86	50,162
July.....	2,270	1,149.0	1,444	5.920	6.82	88,790
August.....	1,178	286.0	764	3.130	3.61	46,977
September.....	472	132.0	235	0.963	1.07	13,983
October.....	246	157.0	202	0.828	0.95	12,420
November.....	286	205.0	238	0.976	1.09	14,162
December.....	180	143.0	166	0.680	0.78	10,207
The year.....	.....	.....	.....	.....	23.12	300,913

## BOW RIVER NEAR KANANASKIS.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 32, Tp. 24, Rge. 8, W. 5th Mer., at the Canadian Pacific Railway bridge, one mile above the Kananaskis Falls dam of the Calgary Power Company.

*Records available.*—March 10, 1912, to December 31, 1915. Records obtained at Morley, ten miles downstream, from May 25, 1910, to November 30, 1911.

*Gauge.*—Chain. Elevation of zero maintained at 90 84 feet since establishment.



Bow River in flood at Calgary, on July 5, 1902. Looking northeast. Note Mr. Birnie's residence again. Water washed the door-step on this occasion.



Bow River in flood at Calgary, on July 5, 1902. Looking north from right bank. Note the water in front of the approach to Langevin bridge. This photograph was also given to us by Mr. Tom Birnie.



## SESSIONAL PAPER No. 25c

*Bench-mark.*—On side of east pier. Assumed elevation, 100.00 feet.

*Channel.*—Permanent, solid rock, fairly uniform.

*Discharge measurements.*—Made from a bridge at very low stages by wading.

*Floods.*—Stream was in flood June 28, gauge height, 4.90 feet. Stream did not overflow banks.

*Observer.*—The Calgary Power Company.

## DISCHARGE MEASUREMENTS of Bow River near Kananaskis, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 5.	H. C. Ritchie	361.0	410.7	1.80	3.45	738
Feb. 16.	do	363.0	557.5	1.44	3.79	804
Mar. 2.	do	351.0	351.0	2.29	1.96	804
Mar. 18.	do	353.0	349.8	2.42	1.96	846
April 1.	do	354.0	337.8	2.26	1.93	762
April 13.	do	354.0	336.8	2.42	1.93	814
May 4 and 5.	do	381.0	515.3	3.63	2.43	1,873
May 18.	do	385.0	597.3	4.02	2.57	2,401
June 2.	do	402.0	706.3	4.91	2.55	3,472
June 16.	do	403.0	777.0	5.29	3.14	4,112
June 29.	do	427.0	1,477.0	8.41	4.79	12,422
July 5.	do	422.5	1,348.0	7.56	4.52	10,193
July 7.	do	423.5	1,307.4	7.10	4.44	9,282
July 16.	do	414.0	1,081.2	6.88	3.87	7,436
Aug. 3.	do	414.0	1,080.4	5.96	3.86	6,434
Aug. 24.	do	406.0	867.4	5.64	3.24	4,896
Sept. 24.	do	382.0	534.0	3.73	2.46	1,993
Oct. 14.	do	382.0	542.4	3.46	2.42	1,977
Oct. 27.	do	373.0	462.8	3.23	2.40	1,494
Nov. 23.	J. E. Caughey	415.0	1,210.0	1.14	4.33	1,380
Dec. 21.	H. C. Ritchie	240.0	732.0	1.63	5.09	1,193

## DAILY GAUGE HEIGHT AND DISCHARGE of Bow River near Kananaskis, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	3.75 <sup>a</sup>	740	4.03	630	1.99 <sup>a</sup>	805	1.95	800	2.44	1,980	2.89	3,426
2.	3.89	798	4.26	715	1.97	836	1.92	746	2.45	2,010	2.86	3,324
3.	3.61	816	4.57	750	2.01	911	1.92	746	2.42	1,920	2.88	3,392
4.	3.55	780	4.39	790	2.04	974	1.91	728	2.40	1,860	2.85	3,290
5.	3.52	738	4.22	820	2.04	974	1.96	818	2.46	2,040	2.88	3,392
6.	3.35	730	4.24	850	2.00	890	1.96	818	2.48	2,100	2.89	3,426
7.	3.39	760	4.15	870	1.90	710	1.95	800	2.49	2,130	2.90	3,460
8.	3.50	780	4.15	880	1.92	746	1.95	800	2.47	2,070	2.92	3,530
9.	3.62	785	4.10	870	1.91	728	1.98	854	2.53	2,315	3.07	4,055
10.	3.47	780	4.04	855	1.92	746	1.94	782	2.81	3,154	3.04	3,950
11.	3.50	770	3.94	840	1.90	710	1.95	800	2.82	3,188	2.94	3,600
12.	3.54	710	3.77	820	1.88	678	1.95	800	2.84	3,256	2.87	3,358
13.	3.62	605	3.73	800	1.87	662	1.95	800	2.90	3,460	2.86	3,324
14.	3.46	580	3.50	780	1.90	710	1.96	818	2.96	3,670	2.87	3,358
15.	3.76	600	3.69	790	1.95	800	1.96	818	2.81	3,154	3.14	4,304
16.	3.70	660	3.76	805	1.95	800	1.94	782	2.65	2,630	3.10	4,160
17.	3.90	720	3.71	820	1.89	694	2.02	932	2.59	2,430	3.17	4,412
18.	3.94	715	3.32	810	1.97	830	2.06	1,016	2.56	2,346	3.38	5,888
19.	3.90	700	3.14	800	1.93	764	2.13	1,172	2.59	2,449	3.30	5,600
20.	3.97	620	2.82	795	1.94	782	2.25	1,465	2.84	2,884	3.48	5,528
21.	3.93	595	2.47	795	1.92	746	2.28	1,540	2.50	2,160	3.44	5,384
22.	3.70	560	2.66	795	1.94	782	2.29	1,565	2.55	2,315	3.45	5,420
23.	3.67	540	2.67	795	2.01	911	2.30	1,590	2.56	2,346	3.45	5,420
24.	3.80	530	2.19	800	1.90	872	2.28	1,340	2.56	2,446	3.47	5,466
25.	3.76	520	2.13	800	1.97	836	2.25	1,465	2.58	2,408	3.61	5,986
26.	3.79	505	2.08	800	2.15	1,220	2.28	1,540	2.66	2,662	4.24	8,492
27.	3.72	500	2.06	800	2.21	1,305	2.25	1,495	2.67	2,684	4.33	8,570
28.	3.75	510	2.00	800	1.90	710	2.25	1,465	2.64	2,726	4.80	14,760
29.	3.74	520	2.00	800	1.95	800	2.30	1,565	2.76	2,958	4.84	15,064
30.	3.74	540			1.94	782	2.36	1,552	2.84	3,366	4.66	17,660
31.	3.81	575			1.94	782			2.86	3,324		

<sup>a</sup> Ice conditions Jan. 1 to Mar. 1.



DAILY GAUGE HEIGHT AND DISCHARGE of Bow River near Kananaskis, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.83	12,898	3.76	6,542	3.09	4,125	2.39	1,833	2.39	1,833	4.80	1,370
2.....	4.84	13,024	3.76	6,542	3.04	3,950	2.39	1,833	2.40	1,860	4.87	1,325
3.....	4.86	13,276	3.84	6,838	3.00	3,810	2.38	1,806	2.36	1,752	5.05	1,305
4.....	4.35	9,030	3.85	6,875	2.98	3,740	2.39	1,833	2.32	1,644	5.03	1,295
5.....	4.48	9,744	3.42	5,312	2.96	3,670	2.40	1,860	2.27	1,515	4.90	1,280
6.....	4.44	9,512	3.39	5,204	2.92	3,530	2.40	1,860	2.25	1,465	4.80	1,250
7.....	4.44	9,512	3.35	5,060	2.81	3,154	2.39	1,833	2.19	1,316	4.50	1,225
8.....	4.36	9,080	3.32	4,952	2.78	3,054	2.43	1,950	2.16	1,244	4.35	1,210
9.....	4.32	8,880	3.29	4,844	2.71	2,823	2.45	2,010	2.15	1,220	4.34	1,200
10.....	4.30	8,780	3.28	4,808	2.69	2,758	2.45	2,010	2.19	1,316	4.32	1,195
11.....	4.25	8,540	3.29	4,844	2.68	2,726	2.44	1,980	2.17	1,268	4.22	1,190
12.....	4.15	8,090	3.31	4,916	2.67	2,694	2.43	1,950	2.16	1,244	4.30	1,195
13.....	3.85	6,875	3.33	4,988	2.61	2,502	2.43	1,950	2.16	1,244	4.29	1,200
14.....	3.59	5,924	3.35	5,060	2.57	2,377	2.41	1,890	2.20a	1,253	4.28	1,200
15.....	3.91	7,100	3.38	5,168	2.51	2,191	2.41	1,890	2.30	1,260	4.29	1,205
16.....	3.86	6,912	3.41	5,276	2.44	1,980	2.40	1,860	2.50	1,280	4.28	1,210
17.....	3.89	7,023	3.39	5,204	2.41	1,890	2.39	1,833	3.00	1,310	4.28	1,210
18.....	3.88	6,986	3.38	5,168	2.42	1,920	2.39	1,833	3.50	1,340	4.35	1,205
19.....	3.87	6,949	3.37	5,132	2.46	2,040	2.40	1,860	3.90	1,350	4.47	1,200
20.....	3.88	6,986	3.50	5,600	2.44	1,980	2.40	1,860	4.20	1,360	4.56	1,200
21.....	3.85	6,875	3.48	5,528	2.43	1,950	2.39	1,833	4.35a	1,375	5.12	1,195
22.....	3.90	7,060	3.40	5,240	2.40	1,860	2.38	1,806	4.55	1,380	4.60	1,190
23.....	3.91	7,100	3.37	5,132	2.39	1,833	2.37	1,779	4.55	1,380	4.56	1,175
24.....	3.89	7,023	3.21	4,556	2.46	2,040	2.36	1,752	4.56	1,375	4.58	1,140
25.....	3.88	6,986	3.19	4,484	2.45	2,010	2.36	1,752	4.55	1,370	4.57	1,060
26.....	3.89	7,023	3.17	4,412	2.43	1,950	2.35	1,725	4.54	1,370	4.50	990
27.....	3.77	6,579	3.14	4,304	2.42	1,920	2.40	1,860	4.55	1,370	4.51	985
28.....	3.75	6,505	3.13	4,268	2.41	1,890	2.39	1,833	4.55	1,375	4.35	980
29.....	3.75	6,505	3.14	4,304	2.42	1,920	2.39	1,833	4.58	1,380	4.36	960
30.....	3.76	6,542	3.15	4,340	2.41	1,890	2.38	1,806	4.63	1,380	4.30	910
31.....	3.75	6,505	3.13	4,268	.....	.....	2.38	1,806	.....	.....	4.24	865

a-a Gauge heights interpolated.

## MONTHLY DISCHARGE of Bow River near Kananaskis, for 1915.

(Drainage area 1631 square miles).—

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	816	500	654	0.401	0.46	40,213
February.....	880	630	803	0.492	0.51	44,596
March.....	1,365	662	825	0.506	0.58	50,727
April.....	1,752	728	1,093	0.670	0.75	65,040
May.....	3,670	1,860	2,570	1.580	1.82	158,020
June.....	13,750	3,290	5,428	3.330	3.72	322,990
July.....	13,276	5,924	8,059	4.940	5.70	495,530
August.....	6,875	4,268	5,134	3.150	3.63	315,680
September.....	4,125	1,833	2,539	1.560	1.74	151,080
October.....	2,010	1,725	1,855	1.140	1.31	114,060
November.....	1,833	1,220	1,394	0.855	0.95	82,949
December.....	1,370	855	1,165	0.714	0.82	71,633
The year.....					21.99	1,912,518

## KANANASKIS RIVER NEAR SEEDE.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 34, Tp. 24, Rge. 8, W. 5th Mer., one and one-half miles above the junction with the Bow River.

*Records available.*—Sept. 1, 1911, to November 11, 1911; January 1, 1912, to December 31, 1915.

*Gauge.*—Chain. Elevation of zero maintained at 88.17 feet since April 20, 1912. Previous to April 20, 1912, gauge readings are at old station one and one-half miles downstream.

## SESSIONAL PAPER No. 25c

Bench-mark.—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made from a cable.

Observer.—The Calgary Power Company.

## DISCHARGE MEASUREMENTS of Kananaskis River near Seebe, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sect.-ft.
Jan. 4	H. C. Ritchie	30.0	71.8	1.71	6.48	123
Jan. 20	do	40.0	61.5	1.45	5.66	89
Feb. 15	do	20.0	72.0	2.12	10.03	152
Mar. 3	do	25.0	77.8	1.85	7.17	144
Mar. 17	do	100.0	185.7	0.76	4.68	142
Mar. 31	do	102.0	178.4	0.71	4.57	126
April 12	do	103.0	188.8	0.82	4.68	155
May 3	do	114.0	270.2	1.81	5.50	489
May 17	do	118.0	325.4	2.61	5.91	850
May 31	do	122.0	361.8	3.13	6.22	1,131
June 15	do	124.0	383.0	3.58	6.38	1,372
June 30	do	128.0	562.8	5.82	7.54	3,275
July 6	do	127.5	503.4	4.62	7.11	2,326
July 8	do	127.5	506.1	4.45	7.08	2,351
July 15	do	125.5	437.4	3.09	6.63	1,745
Aug. 4	do	125.0	432.0	3.86	6.80	1,668
Aug. 25	do	121.0	384.2	3.31	6.28	1,271
Sept. 24	do	120.0	321.1	2.13	5.75	655
Oct. 15	do	116.0	271.4	1.55	5.36	421
Oct. 26	do	109.0	257.6	1.44	5.27	372
Nov. 8	do	113.0	248.9	1.30	5.16	324
Nov. 20	J. E. Caughey	110.0	259.5	1.11	5.15	288
Dec. 6	do	108.0	230.4	1.22	5.05	282

## DAILY GAUGE HEIGHT AND DISCHARGE of Kananaskis River, near Seebe for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sect.-ft.	Feet.	Sect.-ft.	Feet.	Sect.-ft.	Feet.	Sect.-ft.	Feet.	Sect.-ft.	Feet.	Sect.-ft.
1	6.34	119	a	97	7.30	148	4.56	128	5.41	461	6.24	1,188
2	6.54	123	10.24	105	7.15	145	4.58	134	5.45	487	6.32	1,284
3	6.39	120	10.50	111	7.17	144	4.60	140	5.48	507	6.34	1,308
4	6.48	123	9.70	120	7.00	144	4.59	137	5.50	520	6.31	1,272
5	6.09	120	9.33	125	7.08	144	4.60	140	5.52	534	6.33	1,296
6	6.74	115	9.48	131	6.69	143	4.58	134	5.53	541	6.34	1,308
7	6.49	112	9.46	137	6.87	143	4.60	140	5.71	678	6.35	1,320
8	6.36	109	9.07	143	6.87	142	4.62	146	6.13	1,067	6.36	1,332
9	6.33	107	9.14	148	6.07	142	4.62	146	6.21	1,152	6.36	1,332
10	6.05	105	8.95	152	5.30	143	4.64	152	6.21	1,152	6.23	1,176
11	6.04	102	8.60	155	4.53a	142	4.64	152	6.20	1,140	6.19	1,130
12	6.06	100	8.34	155	4.55	125	4.63	149	6.13	1,067	6.20	1,140
13	5.97	98	8.66	149	4.54	122	4.65	155	6.06	995	6.17	1,109
14	6.18	97	8.57	142	4.51	113	4.68	164	6.16	1,098	6.24	1,188
15	5.75	95	9.40	152	4.49	107	4.68	164	6.07	1,005	6.38	1,356
16	6.20	94	9.36	158	4.54	122	4.74	172	5.99	925	6.36	1,332
17	5.96	93	9.32	162	4.53	119	4.78	184	5.92	859	6.67	1,747
18	5.70	92	9.07	161	4.56	128	4.81	193	5.91	850	6.70	1,760
19	5.63	89	8.99	163	4.58	134	4.88	214	5.89	811	6.64	1,703
20	5.66	89	8.76	162	4.57	131	4.96	241	5.81	759	6.64	1,703
21	5.42	86	8.35	160	4.58	134	5.00	255	5.84	786	6.64	1,773
22	8.30	83	8.60	157	4.57	131	4.98	248	5.88	832	6.63	1,669
23	10.05	80	8.15	155	4.57	131	5.00	255	5.96	897	6.63	1,669
24	a	78	7.62	154	4.56	128	5.01	259	6.09	1,025	6.74	1,830
25	a	76	7.33	153	4.58	134	5.04	253	6.16	1,098	6.95	2,175
26	a	75	7.19	151	4.71	163	5.04	273	6.32	1,164	7.01	2,198
27	a	77	7.24	150	4.59	137	5.05	277	6.32	1,164	8.55	3,480
28	a	79	7.12	149	4.52	116	5.06	292	6.27	1,294	8.81	3,804
29	a	80			4.54	122	5.09	296	6.33	1,296	7.65	3,490
30	a	85			4.54	122	5.27	383	6.30	1,760	7.55	3,290
31	a	90			4.57	131			6.24	1,188		

a Gauge under jam.

DAILY GAUGE HEIGHT AND DISCHARGE of Kananaskis River near Seebe, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	7.52	3,217	6.60	1,645	6.18	1,119	5.65	630	5.29	394	5.50	298
2.....	7.30	2,790	6.58	1,617	6.16	1,098	5.64	622	5.30	400	5.53	295
3.....	7.24	2,679	6.57	1,603	6.13	1,067	5.64	622	5.29	394	5.52	291
4.....	7.10	2,430	6.58	1,617	6.12	1,056	5.63	614	5.27	383	5.48	286
5.....	7.05	2,345	6.57	1,603	6.10	1,035	5.61	598	5.25	373	5.20	283
6.....	7.14	2,500	6.56	1,589	6.07	1,005	5.60	590	5.25	373	5.06	282
7.....	7.20	2,605	6.53	1,547	6.05	985	5.58	576	5.20	345	5.04	283
8.....	7.08	2,396	6.50	1,505	5.96	897	5.57	569	5.16	327	5.07	284
9.....	7.04	2,328	6.45	1,442	5.94	878	5.54	548	5.14	318	5.09	281
10.....	7.01	2,277	6.43	1,418	5.92	859	5.51	527	5.18	336	5.20	278
11.....	7.00	2,260	6.40	1,380	5.91	850	5.48	507	5.17	332	5.31	278
12.....	6.90	2,090	6.38	1,356	5.89	831	5.46	494	5.16	327	5.49	277
13.....	6.82	1,970	6.36	1,332	5.84	786	5.43	475	5.16	327	5.70	277
14.....	6.76	1,880	6.34	1,308	5.81	759	5.39	449	5.14	318	5.75	276
15.....	6.75	1,865	6.31	1,272	5.78	734	5.38	444	5.13	314	5.74	277
16.....	6.56	1,589	6.30	1,260	5.75	710	5.38	444	5.13	314	5.75	276
17.....	6.58	1,617	6.28	1,236	5.74	702	5.37	438	5.12	309	5.77	275
18.....	6.58	1,617	6.27	1,224	5.74	702	5.36	433	5.11	304	5.79	274
19.....	6.57	1,603	6.26	1,212	5.75	710	5.37	438	5.12	309	5.87	273
20.....	6.56	1,589	6.54	1,561	5.74	702	5.36	433	5.10	300	5.93	273
21.....	6.60	1,645	6.50	1,505	5.75	710	5.34	422	5.10	300	6.60	271
22.....	6.64	1,703	6.35	1,320	5.74	702	5.32	411	5.10	300	6.20	266
23.....	6.63	1,689	6.32	1,284	5.73	694	5.30	400	5.09	296	6.24	261
24.....	6.62	1,674	6.28	1,236	5.76	718	5.29	394	5.10	300	6.80	253
25.....	6.67	1,747	6.27	1,224	5.74	702	5.28	389	5.12	309	6.22	245
26.....	6.66	1,732	6.25	1,200	5.72	686	5.27	383	5.19	310b	6.20	240
27.....	6.64	1,703	6.22	1,164	5.70	670	5.28	389	5.23	310	6.26	235
28.....	6.65	1,717	6.22	1,164	5.69	662	5.34	422	5.29	306	6.20	230
29.....	6.65	1,717	6.21	1,152	5.69	662	5.32	411	5.37	304	6.37a	224
30.....	6.63	1,689	6.21	1,152	5.67	646	5.30	400	5.40	302	6.54a	215
31.....	6.61	1,659	6.18	1,119	.....	.....	5.30	400	.....	.....	6.71a	204b

a Gauge heights interpolated.

b-b Ice conditions Nov. 26 to Dec. 31.

## MONTHLY DISCHARGE of Kananaskis River near Seebe, for 1915.

(Drainage area 390 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage area.	Acre-feet.
January.....	123	75	97	0.249	0.29	5,964
February.....	163	97	145	0.372	0.39	8,053
March.....	163	107	133	0.341	0.39	8,178
April.....	383	128	200	0.513	0.57	11,901
May.....	1,296	461	921	2.360	2.72	56,630
June.....	5,380	1,109	1,893	4.850	5.41	112,640
July.....	3,217	1,589	2,010	5.150	5.94	123,590
August.....	1,645	1,119	1,363	3.490	4.02	83,810
September.....	1,119	646	811	2.080	2.32	48,258
October.....	630	353	480	1.230	1.42	29,514
November.....	400	296	328	0.841	0.94	19,517
December.....	298	204	266	0.682	0.79	16,356
The year.....	.....	.....	.....	.....	25.20	524,411

## GHOST RIVER AT GILLIES' RANCH.

*Location.*—One mile above the junction with the Bow River, on the NE.  $\frac{1}{4}$  Sec. 23, Tp. 26, Rge. 6, W. 5th Mer.

*Records available.*—August 17, 1911; November 11, 1911; January 1, 1912; December 31, 1915.

*Gauge.*—Chain, on left bank. 1911-13, elevation of zero, 91.15 feet. 1914 to June 26, 1915, elevation of zero. 89.22 feet.

*Bench-mark.*—Assumed elevation, 100.00 feet.

## SESSIONAL PAPER No. 25c

*Channel*.—Shifting gravel, changed after June 26.

*Discharge measurements*.—Made by wading; at very high stages measurements made at highway bridge one mile downstream.

*Flood*.—June 26, gauge height, 10.17. Stream overflowed banks and cut out much larger channel, large amount of debris taken away downstream owing to dam up above gauging section breaking out and causing large rush of water.

*Observer*.—Miss E. Gillies.

## DISCHARGE MEASUREMENTS of Ghost River at Gillies' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 7	H. C. Ritchie	31.0	59.0	1.93	4.50	114.1
Jan. 21	do	26.0	64.8	1.68	4.64	109.0
Feb. 4	do	25.0	68.5	1.42	5.18	97.3
Feb. 18	do	25.0	53.8	1.72	4.24	92.6
Mar. 3	do	25.0	53.0	1.71	3.51	91.0
Mar. 16	do	31.0	43.0	2.24	3.72	96.0
Mar. 30	do	52.5	41.0	2.34	2.92	96.0
April 15	do	55.5	42.4	2.53	3.00	108.0
April 29	G. H. Whyte, H. C. Ritchie	54.0	44.5	2.60	3.07	116.0
June 18	H. C. Ritchie	92.0	239.6	5.49	5.56	1,317.0
Aug. 6	do	86.0	231.0	4.75	4.20	1,096.0
Aug. 27	do	175.5	168.0	3.80	3.76	638.0
Sept. 22	do	92.0	136.7	4.08	3.59	558.0
Oct. 12	do	112.5	149.5	3.04	3.49	455.0
Oct. 28	do	101.0	156.2	2.33	3.37	364.0
Nov. 11	do	99.0	137.2	2.13	3.36	292.0
Nov. 25	J. E. Caughey	96.0	123.7	2.13	3.21	264.0
Dec. 9	do	76.0	93.6	2.62	3.14	247.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Ghost River at Gillies' Ranch, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	4.75a	112	4.74	94	3.60	91	2.95	95	3.18	145	3.93	362
2	4.50	111	5.15	95	3.65	91	3.20	150	3.48	220	4.35	550
3	4.49	111	5.52	96	3.51	91	3.22	155	3.50	225	4.12	438
4	4.40	112	4.40	97	4.05	92	3.32	180	3.68	279	4.14	446
5	4.45	112	4.60	97	4.15	96	3.30	175	3.59	252	3.90	350
6	4.56	113	4.40	98	4.10	96	3.32	180	3.35	187	3.98	382
7	4.50	114	4.40	97	4.15	97	3.26	165	3.75	303	4.45	575
8	4.60	116	4.50	97	3.64	96	3.30	175	3.32	180	4.09	426
9	4.86	117	4.45	97	3.30	95	3.32	180	3.56	243	4.02	398
10	4.36	118	4.80	96	3.32	92	3.38	195	3.54	237	4.00	390
11	4.36	117	5.40	95	3.36	93	3.30	175	3.50	225	4.05	410
12	4.38	116	5.41	94	3.98	95	3.31	177	3.39	198	4.45	530
13	4.90	115	4.95	93	3.98	98	3.15	137	3.79	311	4.20	470
14	5.35	113	4.45	92	3.40	98	3.16	140	3.94	356	4.38	542
15	5.41	110	4.45	92	3.43	96	3.00	105	3.97	378	4.29	506
16	5.54	108	4.40	92	3.47	96	3.02	100	3.75	303	4.74	724
17	4.94	106	4.30	93	3.70	96	3.05	115	3.80	315	4.76	736
18	1.68	105	4.24	93	4.30	96	3.10	125	3.06	374	5.56	1,619
19	4.55	107	4.00	94	4.05	96	3.08	121	3.80	315	5.88	1,662
20	4.36	110	3.85	95	3.85	96	3.05	115	3.90	350	5.75	1,510
21	4.64	109	3.85	96	4.02	97	3.00	105	4.10	439	5.36	1,173
22	4.40	108	4.00	97	4.02	97	2.94	98	4.06	414	5.36	1,171
23	4.40	105	4.22	97	3.45	97	2.99	103	4.15	430	5.66	1,283
24	4.40	102	4.00	94	3.06	97	3.08	121	4.14	446	5.80	1,566
25	4.46	99	3.04	92	3.30	96	3.09	124	4.15	450	5.80	1,566
26	4.44	95	3.05	91	2.90	96	3.00	105	4.40	590	10.17	8,446
27	5.29	93	3.54	90	2.90	96	2.99	103	4.47	498	8.50	7,500
28	5.29	92	3.56	91	2.95	96	2.99	103	4.43	470	1.12	2,500
29	5.05	92			2.90	96	3.02	100	4.49	466	7.12	2,800
30	5.29	93			2.92a	96	3.11	127	4.04	466	7.06	1,796
31	5.10	94			2.96	97			3.88	443		

a-a Winter conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Ghost River at Gillies' Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.55	1,505	4.55	1,505	3.65	560	3.56	490	3.35	342	3.54	475
2.....	4.59	1,557	4.48	1,416	3.65	560	3.56	490	3.34	336	3.39	368
3.....	4.65	1,635	4.40	1,320	3.65	560	3.56	490	3.34	336	3.29	305
4.....	4.80	1,830	4.30	1,210	3.65	560	3.56	490	3.32	323	3.29	305
5.....	4.20	1,100	4.21	1,111	3.64	552	3.55	483	3.30	310	3.25	285
6.....	3.90	785	4.20	1,100	3.62	536	3.52	460	3.30	310	3.21	265
7.....	4.15	1,045	4.28	1,188	3.88	766	3.52	460	3.29	305	3.25	285
8.....	3.86	747	4.15	1,045	3.89	775	3.50	445	3.24	280	3.18	250
9.....	3.86	747	4.10	990	3.88	766	3.46	417	3.26	290	3.17	245
10.....	3.96	845	4.08	969	3.76	654	3.50	445	3.34	336	3.14	244a
11.....	3.75	645	4.05	937	3.74	636	3.50	445	3.36	349	3.27	242
12.....	3.67	576	4.05	937	3.68	584	3.49	438	3.34	336	3.37	240
13.....	4.29	1,199	4.04	927	3.65	560	3.47	424	3.39	369	3.54	238
14.....	5.50	2,825	4.00	885	3.65	560	3.46	417	3.35	332	3.62	236
15.....	5.00	2,100	4.00	885	3.64	552	3.46	417	3.29	305	3.79	234
16.....	4.62	1,596	3.95	835	3.63	544	3.45	410	3.26	290	3.88	232
17.....	5.15	2,317	3.94	825	3.62	536	3.45	410	3.24	280	3.88	231
18.....	5.00	2,100	4.04	927	3.62	536	3.44	403	3.24	280	4.02	230
19.....	4.45	1,380	4.15	1,045	3.70	600	3.44	403	3.24	280	4.08	228
20.....	4.60	1,570	5.10	2,245	3.65	560	3.44	403	3.25	285	4.46	226
21.....	4.65	1,635	4.40	1,320	3.62	536	3.43	396	3.26	290	4.54	224
22.....	4.69	1,687	4.03	917	3.59	512	3.43	396	3.21	265	4.63	220
23.....	4.60	1,570	3.96	845	3.65	560	3.43	396	3.21	265	4.83	216
24.....	4.54	1,492	3.89	775	3.72	618	3.42	389	3.21	265	4.69	213
25.....	4.30	1,210	3.81	700	3.62	536	3.40	375	3.29	305	4.66	207
26.....	4.29	1,199	3.80	690	3.61	528	3.39	369	3.24	280	4.60	202
27.....	4.28	1,188	3.76	654	3.59	512	3.38	362	3.23	275	3.76	196
28.....	4.95	2,030	3.74	636	3.57	497	3.37	356	3.36	349	3.77	190
29.....	4.82	1,856	3.68	584	3.56	490	3.36	349	3.44	403	3.79	182
30.....	4.60	1,570	3.67	576	3.56	490	3.35	342	3.50	445	3.85	175
31.....	4.55	1,505	3.65	560	.....	.....	3.35	342	.....	.....	3.86	167b

a-b Winter conditions.

## MONTHLY DISCHARGE of Ghost River at Gillies' Ranch, for 1915.

(Drainage area 375 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	118	92	107	0.285	0.33	6,579
February.....	98	90	94	0.251	0.26	5,220
March.....	98	91	95	0.253	0.29	5,841
April.....	195	93	135	0.360	0.40	8,033
May.....	550	145	334	0.890	1.03	20,537
June.....	8,440	350	1,301	3.470	3.87	77,420
July.....	2,825	576	1,453	3.870	4.46	89,340
August.....	2,245	560	986	2.630	3.03	60,627
September.....	775	490	574	1.530	1.71	34,155
October.....	490	342	417	1.110	1.28	25,640
November.....	445	265	314	0.837	0.93	18,684
December.....	475	167	244	0.651	0.75	15,003
The year.....	.....	.....	.....	.....	18.34	367,079

## JUMPINGPOUND CREEK NEAR JUMPINGPOUND.

Location.—On the SE.  $\frac{1}{4}$  Sec. 30, Tp. 24, Rge. 4, W. 5th Mer., at Jumpingpound post office.

Records available.—April 19, 1908, to October 31, 1915. Discharge measurements only, June 1906.

## SESSIONAL PAPER No. 25c

*Gauge.*—Vertical staff attached to bridge pile. Elevation of zero has been maintained at 89.82 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on right bank. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—At high water, made from highway bridge; at ordinary stages by wading downstream.

*Winter flow.*—No winter records have been obtained.

*Flood.*—The stream was in flood June 26. Maximum gauge height, 6.59. The stream did not overflow its banks.

*Observer.*—John Bateman.

## DISCHARGE MEASUREMENTS of Jumpingpound Creek near Jumpingpound, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 15.....	H. C. Ritchie.....	15.5	12.1	0.54	2.00	6.7
Mar. 29.....	do.....	34.0	14.8	0.80	1.87	11.8
April 14.....	do.....	30.0	32.6	0.54	1.90	17.7
May 6.....	do.....	59.5	87.4	1.50	2.61	157.0
June 5.....	do.....	106.0	266.0	2.02	3.18	538.0
June 19.....	do.....	119.0	302.0	3.04	3.50	907.0
Aug. 7.....	do.....	69.5	100.8	2.05	2.64	206.0
Aug. 26.....	do.....	69.3	99.9	2.08	2.54	207.0
Sept. 21.....	do.....	66.6	92.3	1.56	2.45	144.0
Oct. 13.....	do.....	65.5	88.0	1.22	2.38	108.0
Oct. 29.....	do.....	64.0	84.4	1.19	2.29	100.0

March 15 ice on sides, stream just breaking up.

## DAILY GAUGE HEIGHT AND DISCHARGE of Jumpingpound Creek near Jumpingpound, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.00	32	2.78	277	2.79	282
2.....			1.98	29	2.48	152	3.54	960
3.....			1.98	29	2.57	185	3.54	960
4.....			1.96	26	2.55	177	3.31	672
5.....			1.95	24	2.56	181	3.29	650
6.....			1.95	24	2.60	196	3.33	695
7.....			1.95	24	2.70	237	3.38	753
8.....			1.94	22	2.75	262	3.34	706
9.....			1.94	22	2.70	237	3.09	469
10.....			1.93	21	2.60	196	3.01	411
11.....			1.92	19	2.55	177	2.96	380
12.....			1.92	19	2.50	158	3.04	473
13.....			1.91	18	2.53	169	3.03	440
14.....			1.92	19	3.30	660	3.20	360
15.....	2.00	32	1.92	19	3.10	476	3.34	796
16.....	2.36	111	1.93	21	2.95	373	3.34	796
17.....	2.65	216	1.94	22	2.75	262	3.68	1,112
18.....	2.55	177	1.96	26	2.54	173	3.88	1,409
19.....	2.44	139	1.99	30	2.40	126	3.24	900
20.....	2.34	109	2.00	32	2.32	103	3.44	838
21.....	2.14	60	2.01	34	2.85	111	3.29	689
22.....	2.03	38	2.02	36	2.60	108	3.29	837
23.....	2.02	36	2.01	34	2.70	80	3.19	263
24.....	2.02	36	2.01	34	3.40	776	3.29	689
25.....	2.00	32	2.01	34	3.55	971	3.64	1,097
26.....	1.97	27	2.01	34	3.45	842	6.59	5,784
27.....	1.95	24	2.01	34	3.30	680	3.94	2,304
28.....	1.94	22	2.01	34	3.17	638	4.74	2,774
29.....	1.93	21	2.01	34	3.10	476	3.84	1,394
30.....	1.92	19	2.08	48	3.05	440	3.69	1,169
31.....	1.92	19			2.89	387		



DAILY GAUGE HEIGHT AND DISCHARGE of Jumpingpound Creek near Jumpingpound, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.55	973	3.13	501	2.34	109	2.49	155
2.....	3.35	718	2.98	393	2.29	95	2.49	155
3.....	3.25	610	2.88	329	2.24	82	2.46	146
4.....	3.40	776	2.83	303	2.53	169	2.46	146
5.....	3.20	560	2.78	277	2.44	139	2.44	139
6.....	3.36	730	2.58	188	2.39	123	2.42	133
7.....	3.45	842	2.57	185	2.44	139	2.46	146
8.....	3.45	842	2.54	173	2.43	136	2.44	139
9.....	3.25	610	2.54	173	2.44	139	2.43	136
10.....	3.05	440	2.52	166	2.45	142	2.46	146
11.....	3.06	447	2.51	162	2.43	136	2.45	142
12.....	3.01	411	2.49	155	2.43	136	2.43	136
13.....	3.56	987	2.48	152	2.40	126	2.42	133
14.....	5.06	3,336	2.45	142	2.42	133	2.40	126
15.....	3.86	1,424	2.43	136	2.40	126	2.39	123
16.....	3.66	1,126	2.42	133	2.40	126	2.39	123
17.....	4.56	2,536	2.41	129	2.41	129	2.38	120
18.....	4.56	2,536	2.39	123	2.52	166	2.43	136
19.....	3.96	1,578	2.38	120	2.50	158	2.42	133
20.....	3.66	1,126	3.61	1,054	2.50	158	2.42	133
21.....	3.37	741	3.33	695	2.48	152	2.40	126
22.....	3.27	630	2.90	340	2.46	146	2.38	120
23.....	3.27	630	2.65	216	2.44	139	2.38	120
24.....	3.22	580	2.57	185	2.49	155	2.37	117
25.....	3.22	580	2.57	185	2.48	152	2.36	114
26.....	3.77	1,287	2.54	173	2.47	149	2.35	111
27.....	3.02	418	2.49	155	2.46	146	2.34	109
28.....	3.07	454	2.46	146	2.48	152	2.36	114
29.....	3.42	802	2.43	136	2.44	139	2.34	109
30.....	3.08	862	2.39	123	2.44	139	2.34	109
31.....	3.03	426	2.36	114	.....	.....	2.35	111

MONTHLY DISCHARGE of Jumpingpound Creek near Jumpingpound, for 1915.

(Drainage area 185 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (15 to 31).....	216	19	66	0.357	0.23	2,217
April.....	48	18	28	0.151	0.17	1,666
May.....	973	103	342	1.850	2.13	21,029
June.....	5,784	282	1,042	5.630	6.28	62,000
July.....	3,336	411	968	5.230	6.03	59,520
August.....	1,054	114	241	1.300	1.50	14,819
September.....	169	82	138	0.746	0.83	8,212
October.....	155	109	129	0.697	0.80	7,932
The period.....	.....	.....	.....	.....	18.07	177,395

BOW RIVER AT CALGARY.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 15, Tp. 24, Rge. 1, W. 5th Mer., at Langevin traffic bridge on 4th street E. in the city of Calgary.

*Records available.*—May 5, 1908, to Dec. 31, 1915.

*Gauges.*—Standard chain type on Langevin bridge; elevation of zero maintained at 82.59 feet during 1915. Gurley automatic gauge on central pier. Elevation of zero maintained at 82.59 feet during 1915. Vertical staff gauge set in cement on central pier. Elevation of zero maintained at 87.20 feet during 1915.

*Bench-mark.*—Permanent iron bench-mark near the intersection of Second and Third avenues, East. Assumed elevation, 100.00 feet.

*Channel.*—Coarse gravel, shifting in floods.



## SESSIONAL PAPER No. 25c

Discharge measurements.—Made from bridge.

Floods.—June 26, 1915, maximum chain gauge height was 12.50 feet with corresponding discharge of 41,650 sec.-feet.

Observer.—C. A. Lang.

## DISCHARGE MEASUREMENTS OF Bow River at Calgary, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 8, 9	R. J. McGuinness.	278.0	700	1.74	4.67c	1,220
Jan. 26.	H. S. Kerby.	270.0	707	1.49	5.64c	1,256
Feb. 11.	H. W. Rowley	175.0	655	1.76	5.40c	1,155
Mar. 2.	do	274.0	679	1.90	5.52c	1,287
Mar. 24.	R. J. McGuinness.	175.0	451	3.85	4.60c	1,452
April 6.	do	284.0	1,000	1.71	4.50c	1,715
April 28.	do	253.0	627	2.07	4.15c	1,922
May 20.	H. M. Nelson.	295.0	1,264	3.14	5.10c	3,963
June 9.	do	307.0	1,615	4.44	6.22c	7,172
June 26.	G. H. Whyte	356.5	3,833	9.64	10.59a	36,942
June 27.	do	356.5	3,472	8.22	10.13a	28,555
June 27.	do	358.0	3,250	6.95	9.84a	22,601
June 28.	do	358.0	3,149	7.46	9.39a	23,497
June 29.	G. R. Elliott.	356.0	2,906	7.00	9.10a	20,343
July 8.	do	332.3	2,597	5.90	8.32a	15,319
Aug. 10.	H. M. Nelson.	318.3	1,682	4.85	6.65a	8,286
Sept. 13.	do	312.3	1,299	3.24	5.30a	4,213
Nov. 5.	do	295.3	984	2.30	4.30a	2,261
Dec. 13.	F. K. Beach.	265.3	635	2.25	3.98c	1,431

a Automatic gauge.

c Chain gauge.

## DAILY GAUGE HEIGHT AND DISCHARGE OF Bow River at Calgary, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	5.04a	1,050	5.64	1,260	5.47	1,280	4.33	1,510	4.52	2,480	5.72	5,460
2.	5.01	1,060	5.69	1,240	5.48	1,287	4.32	1,520	4.80	3,060	5.86	5,800
3.	4.94	1,070	5.69	1,220	5.45	1,296	4.29	1,580	4.80	3,060	6.08	6,540
4.	5.01	1,085	5.67	1,200	5.36	1,307	4.34	1,700	4.76	2,972	5.98	6,240
5.	4.94	1,100	5.64	1,187	5.28	1,315	4.49	1,820	4.72	2,884	5.94	6,120
6.	4.84	1,120	5.61	1,175	5.19	1,321	4.30	1,715	4.66	2,760	5.92	6,060
7.	4.33	1,145	5.51	1,165	5.26	1,328	4.12	1,590	4.90	3,360	5.97	6,210
8.	4.44	1,180	5.36	1,155	5.17	1,335	3.94	1,360	5.15	3,925	6.30	7,230
9.	4.69	1,220	5.31	1,150	5.10	1,342	3.88b	1,250	5.35	4,438	6.18	6,840
10.	4.79	1,240	5.33	1,150	5.16	1,352	3.82	1,194	5.65	5,262	5.96	6,180
11.	4.81	1,275	5.27	1,155	5.09	1,361	3.88	1,296	5.65	5,262	5.91b	6,630
12.	4.92	1,305	5.27	1,155	4.97	1,372	3.95	1,415	5.66	5,290	6.14c	6,520
13.	5.04	1,320	5.02	1,160	5.02	1,383	3.85	1,245	5.50	4,850	6.10	6,400
14.	4.86	1,300	5.30	1,170	4.97	1,397	3.88	1,296	5.72	5,460	6.11	6,470
15.	4.78	1,265	5.05	1,185	4.92	1,407	3.83	1,211	5.81	5,730	6.21	6,735
16.	4.69	1,235	5.50	1,197	4.91	1,420	3.84	1,228	5.45	4,712	6.33	7,155
17.	4.62	1,205	5.47	1,204	4.92c	1,428	3.86	1,262	5.32	4,335	6.75	8,625
18.	4.58	1,235	5.50	1,206	4.93	1,438	3.95	1,415	5.30	4,800	7.44	11,300
19.	5.05	1,320	5.47	1,209	4.91	1,445	4.10	1,680	5.25	4,175	7.42	11,230
20.	4.94	1,300	5.50	1,206	4.86	1,455	4.12	1,716	5.10	3,800	7.27	11,080
21.	4.75	1,270	5.40	1,196	4.80	1,460	4.22	1,898	5.08	3,750	7.25	10,600
22.	4.75	1,245	5.30	1,192	4.76	1,462	4.27	1,993	5.10	3,800	7.19	10,300
23.	4.40	1,245	5.37	1,196	4.73	1,460	4.27	1,993	5.85	4,468	7.19	10,000
24.	4.54c	1,270	5.41	1,206	4.54	1,452	4.24	1,976	5.51	4,828	7.29	10,120
25.	4.69c	1,260	5.47	1,221	4.39	1,440	4.25	1,955	5.79	5,070	7.30	11,800
26.	4.83c	1,256	5.50	1,240	4.29	1,442	4.23	1,917	5.81	5,790	7.37	12,180
27.	4.97c	1,270	5.57	1,260	4.26	1,454	4.19	1,842	5.71	5,480	7.39	12,870
28.	5.11c	1,278	5.50	1,267	4.31	1,466	4.18	1,824	5.68	5,945	7.46	12,420
29.	5.25c	1,283			4.30	1,482	4.29	1,860	5.78	5,494	7.50	13,000
30.	5.39	1,280			4.31	1,497	4.24	1,936	5.83	5,790	8.33	18,720
31.	5.44	1,275			4.31	1,504			5.79	5,770		

a-b Ice conditions.

a-d Chain gauge.

c Gauge heights interpolated.

e-f Auto gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Bow River at Calgary, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	8.866	18,590	7.49	11,560	6.06	6,280	4.86	3,016	4.49	2,276	4.22	1,390
2.....	8.76	17,940	7.34	10,960	6.06	6,280	4.86	3,016	4.46	2,217	3.98	1,390
3.....	8.62	17,030	7.28	10,720	6.00	6,100	4.88	3,058	4.43	2,158	3.97	1,406
4.....	8.38	15,700	7.23	10,520	5.84	5,620	4.86	3,016	4.51	2,314	4.38	1,425
5.....	8.34	15,500	7.09	9,960	5.76	5,380	4.83	2,953	4.54	2,373	4.39	1,450
6.....	8.35	15,550	6.95	9,400	5.77	5,410	4.82	2,932	4.36	2,026	4.44	1,465
7.....	8.32	15,400	6.84	8,960	5.80	5,500	4.82	2,932	4.27	1,860	4.37	1,475
8.....	8.32	15,400	6.75	8,625	5.70	5,200	4.81	2,911	4.26	1,841	4.39	1,485
9.....	8.34	15,500	6.70	8,450	5.65	5,050	4.80	2,890	4.19	1,714	4.43	1,470
10.....	8.36	15,600	6.61	8,135	5.01	3,333	4.78	2,850	4.16	1,664	4.33	1,440
11.....	8.39	15,750	6.56	7,960	5.10	3,540	4.76	2,810	4.15	1,648	4.10	1,415
12.....	8.42	15,910	6.51	7,785	5.19	3,747	4.74	2,770	4.21b	1,748	4.21	1,410
13.....	8.45	16,075	6.51	7,785	5.28	3,970	4.72	2,730	4.16a	1,760	4.26	1,431
14.....	8.48	16,240	6.42	7,470	5.17	3,701	4.70	2,690	4.17	1,760	4.13	1,330
15.....	7.99	13,755	6.40	7,400	5.08	3,494	4.69	2,670	4.57	1,748	4.06	1,275
16.....	8.08	14,200	6.37	7,295	5.02	3,356	4.68	2,650	4.55	1,715	3.99	1,260
17.....	8.57	16,735	6.37	7,295	5.00	3,310	4.67	2,630	4.64	1,680	3.78	1,260
18.....	8.39	15,750	6.49	7,715	4.98	3,268	4.66	2,610	4.60	1,620	3.95	1,260
19.....	8.16	14,600	6.75	8,625	5.06	3,448	4.65	2,590	4.50	1,580	4.12	1,260
20.....	8.02	13,900	7.49	11,560	5.11	3,563	4.64	2,570	4.50	1,560	4.44	1,255
21.....	7.91	13,395	7.14	10,160	5.06	3,448	4.63	2,550	4.40	1,560	4.49	1,245
22.....	7.83	13,035	6.73	8,555	5.02	3,356	4.62	2,530	4.35	1,560	4.81	1,225
23.....	7.80	12,900	6.47	7,645	5.15	3,655	4.61	2,510	4.44	1,565	4.88	1,195
24.....	7.66	12,270	6.30	7,050	5.18	3,724	4.60	2,490	4.60	1,565	4.71	1,150
25.....	7.66	12,270	6.34	7,190	5.09	3,517	4.59	2,470	4.58	1,550	4.69	1,075
26.....	7.59	11,960	6.26	6,910	5.02	3,356	4.58	2,451	4.52	1,525	4.67	1,020
27.....	7.48	11,520	6.18	6,640	5.00	3,310	4.57	2,432	4.51	1,490	4.53	985
28.....	8.24	10,560	6.12	6,460	4.97	3,247	4.56	2,412	4.23	1,460	4.33	960
29.....	7.68	12,360	6.04	6,220	4.95	3,205	4.48	2,256	4.10	1,430	4.20	955
30.....	7.49	11,560	6.03	6,190	4.89	3,079	4.51	2,314	4.06	1,400	4.53	970
31.....	7.50	11,600	6.05	6,250	.....	.....	4.54	2,373	.....	.....	4.78a	1,010

a-a Chain gauge and ice conditions.

b-b Auto gauge.

## MONTHLY DISCHARGE of Bow River at Calgary, for 1915.

(Drainage area 3,113 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,320	1,050	1,225	0.394	0.45	75,323
February.....	1,267	1,150	1,197	0.385	0.40	66,478
March.....	1,504	1,280	1,400	0.450	0.52	86,083
April.....	1,983	1,194	1,605	0.516	0.58	95,504
May.....	5,790	2,480	4,459	1.432	1.66	274,173
June.....	28,130	5,460	10,440	3.354	3.74	621,223
July.....	18,590	10,560	14,470	4.648	5.36	889,725
August.....	11,560	6,190	8,305	2.668	3.08	510,655
September.....	6,280	3,079	4,115	1.322	1.48	244,860
October.....	3,058	2,256	2,680	0.861	0.99	164,787
November.....	2,373	1,400	1,746	0.561	0.63	103,894
December.....	1,485	955	1,269	0.408	0.47	78,028
The year.....	.....	.....	.....	.....	19.36	3,210,733

## SESSIONAL PAPER No. 25c

## ELBOW RIVER AT FULLERTON'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 12, Tp. 23, Rge. 5, W. 5th Mer., at E. R. Fullerton's ranch, thirty-five miles southwest of Calgary.

*Records available.*—September 29, 1914, to December 31, 1915.

*Gauge.*—Vertical staff on right bank. Zero elevation maintained at 90.83 feet during 1914 and January, 1915. Standard chain on log traffic bridge about 300 feet downstream from staff. Zero elevation maintained at 85.40 feet during 1914 and from January 1 to June 26, 1915. Vertical staff on left bank opposite staff on right bank. Zero elevation maintained at 90.83 feet from July 20 to December 31, 1915.

*Bench-mark.*—Tree stump on right bank. Assumed elevation, 100.00 feet. Permanent iron, on left bank near staff. Elevation, 100.00 feet, same as above. Assumed datum.

*Channel.*—Boulders, fairly permanent.

*Discharge measurements.*—Made by wading or from bridge.

*Flood.*—Bridge and all gauges carried away on June 26, 1915. Maximum staff gauge height from high water mark 7.53 feet, with corresponding discharge of 11,300 sec.-ft., estimated from slope measurements.

*Observer.*—E. R. Fullerton.

## DISCHARGE MEASUREMENTS of Elbow River at Fullerton's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 26.....	H. S. Kerby.....	65.0	91.0	0.80	3.30 <sup>c</sup>	73
Feb. 19.....	H. W. Rowley.....	70.0	105.4	1.28	3.36 <sup>c</sup>	135
Mar. 11.....	R. J. McGuinness.....	64.0	96.0	1.53	3.46 <sup>c</sup>	145
Mar. 30.....	do.....	60.0	63.0	2.00	1.90 <sup>c</sup>	126
April 17.....	do.....	60.0	72.2	1.74	2.12 <sup>c</sup>	126
June 15.....	H. B. R. Thompson.....	66.0	194.5	7.08	4.61 <sup>c</sup>	1,378
June 26.....	do.....		948.3	11.92	7.53 <sup>s</sup>	11,299 <sup>a</sup>
July 29.....	do.....	105.5	228.8	6.00	3.11 <sup>s</sup>	1,372
Aug. 30.....	do.....	102.5	139.2	3.59	1.70 <sup>s</sup>	500
Sept. 27.....	do.....	103.0	155.0	4.25	1.78 <sup>s</sup>	660
Nov. 2.....	F. K. Beach.....	97.3	111.0	3.18	1.44 <sup>s</sup>	351
Dec. 14.....	do.....	85.0	110.0	2.12	1.81 <sup>s</sup>	233

<sup>a</sup> Slope measurement.

<sup>c</sup> Chain gauge.

<sup>s</sup> Staff gauge.

## DAILY GAUGE HEIGHT AND DISCHARGE of Elbow River at Fullerton's Ranch, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.44 <sup>a</sup>	128	3.35	60	3.47	145	1.88	125	2.51	246	4.54	1,327
2.....	2.39	130	3.61	60	3.47	145	1.92	125	3.06	462	4.56	1,341
3.....	2.41	131	3.64	60	3.37	145	1.92	125	3.26	553	4.66	1,415
4.....	2.42	132	3.56	61	3.07	145	1.93	125	3.29	567	4.66	1,415
5.....	2.40	132	3.52	62	3.07	145	1.95	125	3.36	602	4.66	1,415
6.....	2.40	133	3.52	64	3.08	145	1.98	125	3.56	708	4.91	1,630
7.....	2.40	133	3.52	67	3.28	145	2.04	125	3.79	841	4.80	1,530
8.....	2.38	133	3.44	70	3.32	145	2.03	125	4.21	1,104	4.66	1,415
9.....	2.37	133	3.46	74	3.68	145	2.03	125	4.51	1,305	4.66	1,415
10.....	2.37	133	3.47	78	3.11	145	2.04	125	4.46	1,270	4.61	1,378
11.....	2.33	132	3.47	83	3.12	145	2.04	125	4.46	1,270	4.66	1,415
12.....	2.33	131	3.34	87	3.14	145	2.05	125	4.01	974	4.66	1,415
13.....	2.63	130	3.39	92	3.15	144	2.07	125	4.04	994	4.66	1,415
14.....	2.46	128	3.64	97	3.15	144	2.09	125	4.06	1,006	4.66	1,415
15.....	2.45	127	3.67	104	3.15	143	2.09	125	4.06	1,006	4.66	1,415
16.....	2.63	125	3.62	113	3.15	142	2.07	126	4.06	1,006	4.66	1,415
17.....	2.66	122	3.37	121	1.99	141	2.06	126	4.11	1,038	5.16	1,890
18.....	2.66	120	3.57	129	1.87	141	2.06	126 <sup>a</sup>	4.06	1,006	5.06	1,783
19.....	2.61	115	3.42	135	1.99	140	2.17	144	4.14	1,058	5.06	1,783
20.....	2.57	109	3.38	137	1.99	139	2.16	141	4.21	1,104	5.04	1,762
21.....	2.45	102	3.57	137	1.91	138	2.16	141	4.26	1,136	5.01	1,730
22.....	3.30 <sup>b</sup>	92	3.57	139	1.97	137	2.22	158	4.11	1,038	4.96	1,680
23.....	3.31	83	3.47	140	1.99	136	2.15	138	4.31	1,169	4.92	1,640
24.....	3.31	78	3.46	141	1.96	135	2.26	169	4.76	1,486	4.86	1,584
25.....	3.32	74	3.48	142	1.89	134	2.27	172	5.16	1,890	5.77 <sup>b</sup>	2,714
26.....	3.33	73	3.45	143	1.89	133	2.27	172	5.33	2,084	..... <sup>d</sup>	.....
27.....	3.33	71	3.46	144	1.89	132	2.27	172	4.84	1,566	.....	.....
28.....	3.36	69	3.46	144	1.91	130	2.29	177	4.86	1,584	.....	.....
29.....	3.34	66	.....	.....	1.89	128	2.36	198	4.06	1,006	.....	.....
30.....	3.35	64	.....	.....	1.86	126	2.41	213	4.51	1,305	.....	.....
31.....	3.35	62	.....	.....	1.88	125	.....	.....	4.51	1,305	.....	.....

<sup>a</sup>-<sup>a</sup> Ice conditions.<sup>b</sup>-<sup>b</sup> Chain gauge<sup>d</sup> No gauge from June 25 to July 20.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Elbow River at Fullerton's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			2.26	823	1.67	476	1.72	504	1.45c	356	1.89	232
2.			2.21	792	1.64	459	1.72	504	1.46c	361	1.94	232
3.			2.17	768	1.64	459	1.71	499	1.44c	352	1.74	231
4.			2.15	755	1.66	471	1.71	499	1.43c	346	1.84	225
5.			2.11	731	1.68	482	1.71	499	1.42c	340	1.25	210
6.			2.01	671	1.83	566	1.69	487	1.40c	330	1.25	204
7.			1.97	647	1.77	532	1.69	487	1.39	325	1.25	202
8.			1.91	611	1.75	521	1.68	482	1.38	320	1.25	202
9.			1.89	599	1.71	499	1.67	476	1.37	314	1.25	205
10.			1.86	583	1.70	493	1.66	471	1.37	314	1.25	208
11.			1.81	555	1.66	471	1.65	465	1.44b	310	1.66	212
12.			1.76	527	1.63	454	1.64	459	1.44	305	1.66	221
13.			1.76	527	1.60	437	1.64	459	1.44	299	1.71	230
14.			1.71	499	1.63	454	1.63	454	1.39	292	1.77	233
15.			1.71	499	1.62	448	1.62	448	1.34	285	1.91	234
16.			1.71	499	1.62	448	1.61	443	1.39	277	2.01	233
17.			1.72	504	1.62	448	1.60	437	1.44	271	2.31	226
18.			1.72	504	1.75	521	1.58	426	1.34	266	2.31	214
19.			1.77	532	1.78	538	1.56	415	1.44	261	2.37	197
20.	2.50a	972	2.37	891	1.73	510	1.55	410	1.44	257	3.02	179
21.	2.50	972	2.17	768	1.70	493	1.53	398	1.34	253	3.24	165
22.	2.48	960	1.87	588	1.67	476	1.52	393	1.39	249	3.24	155
23.	2.45	941	1.82	560	1.62	448	1.50	382	1.39	245	3.25	145
24.	2.45	941	1.80	549	1.76	527	1.49	377	1.29	242	3.28	139
25.	2.45	941	1.77	532	1.82	560	1.49	377	1.39	239	3.28	131
26.	2.45	941	1.72	504	1.80	549	1.48	372	1.39	237	3.31	123
27.	2.46	947	1.72	504	1.78	538	1.47	366	1.44	236	3.25	116
28.	2.50	972	1.72	504	1.87	588	1.47	366	1.49	234	3.28	112
29.	2.49	966	1.72	504	1.76	527	1.47	366	1.54	233	3.34	107
30.	2.32	860	1.68	482	1.75	521	1.47	366	1.84	233	2.94	105
31.	2.30	848	1.68	482	...	...	1.46	361	...	...	2.79d	104

a-d Staff gauge.  
b-d Ice conditions.  
c Interpolated.

## MONTHLY DISCHARGE of Elbow River at Fullerton's Ranch, for 1915.

(Drainage area 254 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	133	62	109	0.479	6.49	6,782
February	144	60	103	0.406	6.42	5,129
March	145	125	140	0.551	6.64	8,668
April	213	125	142	0.559	6.62	8,420
May	2,084	246	1,087	4.290	4.03	69,887
June (1-25)	2,714	1,327	1,573	6.193	5.76	27,683
July (20-31)	972	848	935	3.693	1.93	22,279
August	891	482	597	2.351	2.11	16,768
September	588	437	497	1.987	2.19	26,434
October	504	361	434	1.709	1.97	26,688
November	361	243	286	1.176	1.90	17,648
December	234	104	185	0.728	0.84	11,111
The year					28.48	317,919

## ELBOW RIVER AT CALGARY.

*Location*.—On the SW.  $\frac{1}{4}$  Sec. 14, Tp. 24, Rge. 1, W. 5th Mer., at city corporation yard, foot of Thirteenth Avenue East, Calgary.

*Records available*.—May 8, 1908 to Dec. 31, 1915.

*Gauge*.—Standard chain on Twelfth Avenue bridge. Elevation of zero maintained at 3,404.82 feet during 1915. Vertical staff at metering section 700 feet upstream from bridge. Elevation of zero maintained at 3,406.95 during 1915.

*Bench-marks*.—(1) Permanent iron bench-mark on left bank near cable station. Elevation 3,423.85 feet above mean sea level. (Geodetic Surveys of Canada.) (2) Permanent bench-mark on corner of wing wall of left abutment of traffic bridge at Twelfth Avenue, East. Elevation, 3,420.07 feet above mean sea level. (Geodetic Surveys of Canada.)

*Channel*.—Composed of coarse gravel and boulders, liable to shift and affected by back-water from the Bow River during flood stages of that stream.

*Discharge measurements*.—Made from a cable car, or in low water by wading.

*Flood*.—June 26, maximum staff gauge height, 10.40 feet, with corresponding discharge of 13,450 sec.-ft.

*Observer*.—Mrs. I. S. White.

## DISCHARGE MEASUREMENTS of Elbow River at Calgary, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 21.....	H. S. Kerby.....	105	174	0.65	1.85c	113
Feb. 12.....	H. W. Rowley.....	100	165	0.60	1.76c	99
Feb. 22.....	do.....	61	54	2.14	1.77c	115
Mar. 3.....	do.....	103	173	0.56	1.80c	97
Mar. 23.....	R. J. McGuinness.....	130	317	1.26	2.32c	401
April 5.....	do.....	125	256	0.78	2.01c	199
April 27.....	do.....	112	92	2.42	1.91c	224
May 17.....	H. M. Nelson.....	145	518	2.46	2.82s	1,272
June 5.....	do.....	145	522	2.66	2.92s	1,387
June 26.....	G. R. Elliott.....	144	1,245	6.60	7.70s	8,217
June 26.....	do.....	144	1,471	8.01	9.46s	11,777
June 27.....	do.....	144	963	6.65	6.17s	5,825
June 28.....	do.....	152	801	4.53	4.88s	3,632
June 30.....	do.....	149	694	3.75	4.09s	2,600
July 3.....	do.....	148	587	3.21	3.45s	1,882
July 14.....	do.....	144	1,187	7.31	7.55s	8,676
Aug. 12.....	H. M. Nelson.....	141	362	2.31	2.10s	838
Sept. 14.....	do.....	140	329	1.71	1.93s	562
Oct. 19.....	do.....	141	319	1.55	1.81s	495
Nov. 22.....	F. K. Beach.....	103	154	1.70	2.02c	262
Dec. 15.....	do.....	110	185	1.13	2.84c	209
Dec. 31.....	do.....	100	184	0.35	2.86c	65

s Staff gauge.

c Chain gauge.



Elbow River in flood at Calgary, on June 26, 1915. Looking downstream at Mission bridge, about two hours before the maximum stage was reached. Note the new concrete arch bridge below the steel truss. Taken by F. H. Peters.



Elbow River in flood at Calgary, on June 26, 1915. Looking downstream at Canadian Northern Railway bridge, about two hours before the maximum stage was reached. Taken by F. H. Peters.





## SESSIONAL PAPER No. 25c

## DAILY GAUGE HEIGHT AND DISCHARGE of Elbow River at Calgary for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.86 <sup>a</sup>	145	1.71	101	1.72	101	1.86	192	1.29 <sup>f</sup>	200	2.66	1,163
2.....	1.80	140	1.78	101	1.73	99	1.93	194	1.62 <sup>k</sup>	382	2.96	1,419
3.....	1.80	142	1.79	101	1.73	97	1.96	196	1.94	598	3.45	1,595
4.....	1.78	146	1.78	101	1.74	97	2.03	193	1.86	542	3.02	1,474
5.....	1.78	148	1.79	101	1.73	97	2.07	200	1.90	570	2.98	1,437
6.....	1.78	148	1.79	100	1.73	97	1.99	203	2.01	648	3.06	1,512
7.....	1.78	146	1.79	100	1.73	97	1.94	207	2.14	747	2.93	1,392
8.....	1.78	145	1.77	100	1.74	97	1.92 <sup>b</sup>	211	2.79	1,267	3.22	1,665
9.....	1.79	146	1.75	100	1.74	98	1.84	216	2.97	1,425	3.09	1,540
10.....	1.82	144	1.76	100	1.69	98	1.84	216	2.75	1,235	2.89	1,356
11.....	1.88	145	1.79	100	1.68	99	1.82	208	2.58	1,099	2.81	1,284
12.....	1.85	144	1.69	99	1.74	100	1.83	212	2.26	843	2.78	1,259
13.....	1.79	143	1.71	101	1.78	102	1.84	216	2.19	787	2.82	1,293
14.....	1.70	140	1.93	108	1.78	103	1.87	228	3.36	1,805	2.90	1,365
15.....	1.66	138	1.75	108	1.78	104	1.87	228	3.17	1,616	2.97	1,428
16.....	1.65	134	1.73	104	1.80	106	1.85	220	2.95	1,410	3.10	1,550
17.....	1.70	123	1.74	106	1.84	108	1.83	212	2.66	1,329	3.20	1,645
18.....	1.76	112	1.74	106	1.84	109	1.82	208	2.79	1,267	3.29	1,735
19.....	1.80	108	1.74	107	1.84	112	1.81	204	2.72	1,211	3.42	1,865
20.....	1.79	109	1.74	112	2.14	180	1.81	204	2.63	1,139	3.47	1,915
21.....	1.85	113	1.80	117	2.33	256	1.82	208	2.74	1,227	3.26	1,705
22.....	1.84	113	1.77	115	2.40	330	1.92	248	2.79	1,267	3.09	1,540
23.....	1.83	112	1.76	112	2.33	401	1.86	224	3.01	1,464	3.03	1,484
24.....	1.80	110	1.68	110	2.30	340	1.87	228	3.16	1,607	.....	1,581 <sup>d</sup>
25.....	1.77	108	1.69	108	2.11	272	1.89	236	3.56	2,005	.....	2,277
26.....	1.70	107	1.70	106	1.82	208	1.92	248	3.40	1,845	.....	8,427
27.....	1.66	105	1.72	104	1.76	192	1.89	236	3.35	1,795	.....	7,068
28.....	1.65	104	1.72	103	1.81	188	1.91	244	3.19	1,636	.....	3,960
29.....	1.65	102	.....	.....	1.80	188	1.93	252	3.09	1,540	.....	2,995 <sup>d</sup>
30.....	1.64	100	.....	.....	1.78	188	1.92 <sup>c</sup>	248	2.95	1,410	4.11	2,648 <sup>f</sup>
31.....	1.66	99	.....	.....	1.82	190	.....	.....	2.75	1,235	.....	.....

<sup>a</sup> to <sup>b</sup> Ice conditions.<sup>a</sup> to <sup>c</sup> Chain gauge.<sup>d</sup> to <sup>d</sup> Average of hourly discharge. Flood tables No. D 5.<sup>k</sup> Gauge heights interpolated.<sup>f-f</sup> Staff gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Elbow River at Calgary, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.04 <sup>c</sup>	2,533	3.16	1,607	1.86	542	2.04	670	1.69	424	2.14	229
2.....	3.54	1,985	3.01	1,464	1.85	535	2.06	685	1.66	406	2.28	228
3.....	3.46	1,905	2.83	1,302	1.87	549	2.11	723	1.65	400	2.25	228
4.....	3.33	1,775	2.71	1,203	1.89	563	2.08	700	1.63	388	2.20	226
5.....	3.39	1,835	2.60	1,115	1.91	577	2.06	685	1.61	376	2.21	224
6.....	3.41	1,855	2.51	1,043	1.89	563	2.05	678	1.61	376	2.23	222
7.....	3.42	1,865	2.40	955	2.08	700	2.02	655	1.60 <sup>c</sup>	370	2.23	221
8.....	3.34	1,785	2.29	867	2.02	655	1.96	612	.....	340 <sup>a</sup>	2.23	219
9.....	3.16	1,607	2.24	827	2.07	692	1.95	605	.....	316	2.19	216
10.....	3.00	1,455	2.20	795	2.07	692	1.93	591	.....	296 <sup>a</sup>	2.20	214
11.....	2.81	1,284	2.14	447	1.95	605	1.93	591	1.95 <sup>b</sup>	290	2.33	213
12.....	2.74	1,227	2.08	700	1.96	612	1.91	577	1.94	286	2.40	212
13.....	2.71	1,203	2.02	655	1.92	684	1.91	577	1.99	281	2.46	210
14.....	5.13	4,033	2.12	731	1.87	549	1.91	577	2.12	280	.....	209
15.....	4.36	2,933	2.05	678	1.90	570	1.91	577	2.09	277	2.85	208
16.....	4.19	2,718	2.04	670	1.86	542	1.90	570	2.05	274	2.87	207
17.....	4.41	2,998	1.99	633	1.84	528	1.89	563	2.04	272	2.94	206
18.....	4.49	3,102	1.98	626	1.84	528	1.88	556	2.03	270	2.72	205
19.....	3.84	2,304	2.12	731	2.07	692	1.81	507	1.96	267	2.54	204
20.....	3.60	2,045	3.59	2,035	1.95	605	1.83	521	1.92	265	2.49	202
21.....	3.29	1,735	3.05	1,502	1.94	598	1.83	521	1.88	264	2.49	196
22.....	3.17	1,616	2.68	1,179	2.01	648	1.82	514	2.02	264	2.49	190
23.....	3.10	1,550	2.45	995	2.17	771	1.82	514	2.11	261	2.44	184
24.....	3.06	1,512	2.31	883	2.39	947	1.79	493	2.03	259	2.39	172
25.....	2.95	1,410	2.26	843	2.32	891	1.76	472	2.01	256	2.34	152
26.....	2.88	1,347	2.14	747	2.25	835	1.71	437	2.02	253	2.32	134
27.....	2.82	1,293	1.84	528	2.21	803	1.70	430	2.06	251	2.50	116
28.....	3.16	1,607	2.01	648	2.17	771	1.69	424	1.95	246	2.68	101
29.....	3.31	1,755	1.93	591	2.11	723	1.69	424	1.98	240	2.87	080
30.....	3.50	1,945	1.88	556	2.08	700	1.69	424	2.00	234	3.14	069
31.....	3.16	1,607	1.87	549	.....	.....	1.69	424	.....	.....	2.87 <sup>b</sup>	065

a-a. Discharges interpolated.

b-b Ice conditions and chain gauge.

c-c Staff gauge.

## MONTHLY DISCHARGE of Elbow River at Calgary, for 1915.

(Drainage area 474 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	148	99	126	0.266	0.31	7,747
February.....	117	99	105	0.222	0.23	5,831
March.....	401	97	157	0.331	0.38	9,654
April.....	252	192	218	0.460	0.51	12,972
May.....	2,065	200	1,198	2.530	2.92	73,662
June.....	8,427	1,163	2,127	4.490	5.01	126,565
July.....	4,033	1,203	1,930	4.070	4.69	118,670
August.....	2,035	447	907	1.910	2.20	55,769
September.....	947	528	656	1.380	1.54	39,035
October.....	723	424	558	1.180	1.36	34,310
November.....	424	234	299	0.631	0.70	17,792
December.....	229	65	186	0.392	0.45	11,437
The year.....	.....	.....	.....	.....	20.30	513,444

## SESSIONAL PAPER No. 25c

## NOSE CREEK AT CALGARY.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 13, Tp. 24, Rge. 1, W. 5th Mer., on wooden traffic bridge near mouth of Nose Creek.

*Records available.*—April 24, 1911, to October 31, 1915.

*Gauge.*—Vertical staff set on central abutment of bridge on upstream side. Elevation of zero maintained at 92.81 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on left bank near end of bridge. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent.

*Discharge measurements.*—Made from bridge or by wading.

*Floods.*—June 26, 1915, maximum gauge height was 6.85 feet caused partly by backwater from the Bow River. August 20, 1915, gauge height was 5.60 feet with a corresponding maximum discharge of 1,935 sec.-feet.

*Observer.*—C. A. Lang.

## DISCHARGE MEASUREMENTS of Nose Creek at Calgary, in 1915.

DATE.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 7.....	R. J. McGuinness.....	21 0	8 6	1 43	1 50	12 3
April 27.....	do.....	22 5	10 6	0 91	1 71	9 6
May 19.....	H. M. Nelson.....	24 0	39 5	2 35	2 24	93 0
June 7.....	do.....	23 5	30 5	1 59	1 95	48 0
July 15.....	do.....	123 0	210 3	2 35	3 40	549 0
July 29.....	G. H. Whyte, H. M. Nelson.	157 5	406 1	2 75	4 31	1,118 0
Aug. 13.....	H. M. Nelson.....	64 0	98 2	0 88	2 24	87 0
Sept. 13.....	do.....	113 0	142 5	1 31	2 39	187 0

## DAILY GAUGE HEIGHT AND DISCHARGE of Nose Creek at Calgary, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1 83	21	1 70	9	1 85	23
2.....	1 83	21	1 70	9	1 95	35
3.....	1 85	23	1 70	9	2 12	64
4.....	1 85	23	1 68	8	2 14	68
5.....	1 85	23	1 68	8	2 10	60
6.....	1 84	22	1 67	7	2 06	57
7.....	1 80	18	1 71	9	1 96	37
8.....	1 83	21	1 71	9	1 93	32
9.....	1 78	16	1 70	9	1 85	28
10.....	1 72	10	1 71	9	1 85	23
11.....	1 70	9	1 67	7	1 85	20
12.....	1 68	8	1 66	7	1 85	19
13.....	1 70	9	1 72	10	1 85	24
14.....	1 70	9	1 90	28	1 85	28
15.....	1 68	8	2 11	61	1 85	28
16.....	1 67	7	2 22	83	1 85	21
17.....	1 68	8	2 52	166	1 85	28
18.....	1 68	8	2 30	104	1 85	28
19.....	1 66	7	2 25	92	2 15	70
20.....	1 68	8	2 22	83	2 12	64
21.....	1 75	13	2 08	56	2 09	55
22.....	1 70	9	1 90	58	2 09	48
23.....	1 65	6	1 90	58	2 01	45
24.....	1 65	6	1 90	58	1 90	37
25.....	1 65	6	1 95	55	2 85	125
26.....	1 65	6	1 95	55	6 58	1,935
27.....	1 68	8	1 87	54	5 50	750
28.....	1 65	6	1 84	52	4 85	512
29.....	1 68	8	1 85	49	2 95	400
30.....	1 68	8	1 82	49	3 40	464
31.....			1 80	18		

a Gauge affected by backwater.

DAILY GAUGE HEIGHT AND DISCHARGE OF NOSE CREEK AT CALGARY, FOR 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.92	305	3.65	693	2.38	125	2.36	120
2.....	2.65	204	3.05	364	2.35	117	2.35	117
3.....	2.50	158	2.85	277	2.33	112	2.39	127
4.....	2.30	104	2.74	235	2.33	112	2.45	144
5.....	2.20	80	2.63	194	2.34	114	2.42	136
6.....	2.16	72	2.55	173	2.35	117	2.40	130
7.....	2.15	70	2.43	138	2.36	120	2.38	125
8.....	2.14	68	2.38	125	2.43	138	2.36	120
9.....	2.10	60	2.36	120	2.45	144	2.34	114
10.....	2.04	49	2.34	114	2.42	136	2.34	114
11.....	1.90	28	2.30	104	2.40	130	2.34	114
12.....	1.85	23	2.25	92	2.40	130	2.34	114
13.....	1.92	31	2.25	92	2.40	130	2.34	114
14.....	3.71	729	2.25	92	2.40	130	2.34	114
15.....	3.13	403	2.25	92	2.40	130	2.34	114
16.....	3.03	354	2.25	92	2.40	130	2.32	109
17.....	3.38	535	2.24	90	2.42	133	2.32	109
18.....	3.25	464	2.27	97	2.38	125	2.30	104
19.....	3.32	501	2.28	99	2.38	125	2.30	104
20.....	3.23	454	5.60	1,935	2.38	125	2.30	104
21.....	3.05	364	5.13	1,634	2.36	120	2.30	104
22.....	2.69	217	4.93	1,506	2.39	127	2.28	99
23.....	2.65	204	3.48	592	2.38	125	2.27	97
24.....	2.62	194	3.05	364	2.60	188	2.26	94
25.....	2.53	167	2.91	300	2.74	235	2.26	94
26.....	2.45	144	2.76	243	2.63	198	2.26	94
27.....	2.35	117	2.66	207	2.53	167	2.23	87
28.....	2.88	288	2.66	176	2.48	152	2.23	87
29.....	4.25	1,071	2.49	155	2.45	144	2.22	85
30.....	4.49	1,225	2.45	144	2.39	127	2.20	80
31.....	4.14	1,001	2.40	130	.....	.....	2.20	80

## MONTHLY DISCHARGE OF NOSE CREEK AT CALGARY, FOR 1915.

(Drainage area 294 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage area	Total in Acre-feet.
April (1-30).....	23	6	11.8	0.040	0.05	702
May.....	166	7	34.0	0.116	0.13	2,091
June.....	1,011	21	140.0	0.476	0.53	8,330
July.....	1,225	23	312.0	1.060	1.22	19,155
August.....	1,935	90	344.0	1.170	1.35	21,153
September.....	235	112	137.0	0.466	0.52	8,152
October (1-31).....	144	80	108.0	0.367	0.42	6,641
The period.....	.....	.....	.....	.....	4.22	66,254

## CANADIAN PACIFIC RAILWAY COMPANY CANAL AT OGDEN.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 21, Tp. 23, Rge. 29, W. 4th Mer., one-half mile south of Ogden Post Office and about six miles below the headgates of the main canal "A."

*Records available.*—May 1, 1911, to September 14, 1915, and at station two miles upstream from May 8, 1908, to October 9, 1910.

*Gauge.*—Vertical staff in wooden bay of C.P.R. automatic gauge cabin on left bank of canal at end of bridge No. 3. Elevation of zero maintained at 86.65 feet during 1915.

*Bench-mark.*—An iron post in left bank and two feet from lower end of left abutment of wooden traffic bridge about one hundred feet downstream from section. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent.

*Discharge measurements.*—Made from bridge.

*Observer.*—A. Hatcher.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Canadian Pacific Railway Company Canal at Ogden, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 19.....	H. M. Nelson.....	61	180.1	1.71	2.55	307
June 8.....	do .....	59	158.6	1.53	2.57	242
July 23.....	do .....	49	76.6	0.88	1.10	67
Aug. 12.....	do .....	56	134.7	1.52	2.16	205
Sept. 14.....	do .....	55	115.5	1.33	1.93	153

## DAILY GAUGE HEIGHT AND DISCHARGE of Canadian Pacific Railway Company Canal at Ogden, for 1915.

DAY.	May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.20	195	2.25	203	1.25	80	2.01	167	2.09	177
2.....	2.20	195	2.40	227	1.53	106	2.03	168	2.10	179
3.....	2.20	195	2.45	236	1.82	139	2.05	171	2.08	176
4.....	2.20	195	2.50	245	2.11	181	2.00	164	2.06	173
5.....	2.20	195	2.47	240	2.40	227	2.00	164	2.05	171
6.....	2.40	227	2.43	232	5.80	840	2.00	164	2.03	168
7.....	2.60	263	2.40	227	4.95	686	1.65	118	2.00	164
8.....	2.40	227	2.57	259	4.10	533	1.82	139	1.98	161
9.....	2.37	221	2.44	234	4.22	555	2.00	164	1.96	158
10.....	2.33	216	2.30	211	4.35	578	2.18	192	1.95	157
11.....	2.30	211	2.30	211	4.28	565	2.18	192	1.93	154
12.....	2.30	211	2.32	214	4.21	553	2.18	192	1.91	151
13.....	2.30	211	2.34	217	4.15	542	2.16	189	1.90	150
14.....	2.25	203	2.37	222	3.80	479	2.15	187	1.93	154
15.....	2.42	231	2.28	208	3.45	416	2.13	184	1.89	148
16.....	2.59	261	2.20	195	3.10	353	2.10	179	1.85	143
17.....	2.77	294	2.12	182	3.05	344	2.02	167	1.83	140
18.....	2.95	326	2.36	221	3.55	434	1.94	156	1.80	136
19.....	2.85	308	2.60	263	4.05	524	1.87	146	1.80	136
20.....	3.10	353	2.85	308	4.55	614	1.80	136	1.80	136
21.....	3.10	353	3.10	353	5.05	704	1.70	124	1.80	136
22.....	3.20	371	3.15	362	3.07	348	1.75	130	1.81	137
23.....	3.10	353	3.20	371	1.10	68	1.80	136	1.82	139
24.....	2.81	301	3.25	380	1.13	70	1.85	143	1.83	140
25.....	2.52	249	3.30	389	1.17	74	1.90	150	1.85	143
26.....	2.23	200	2.95	326	1.20	76	1.92	153	1.85	143
27.....	1.95	157	2.61	265	1.65	118	1.87	146	1.85	143
28.....	1.98	161	2.27	206	2.10	179	1.80	136	1.85	143
29.....	2.02	167	1.93	154	2.05	171	1.89	149		
30.....	2.06	173	1.59	112	2.00	184	1.98	161		
31.....	2.10	179			2.01	165	2.08	176		

## MONTHLY DISCHARGE of Canadian Pacific Railway Company Canal at Ogden, for 1915.

(Drainage area . . . . square miles.)

MONTH.	DISCHARGE IN SECOND-FOOT			RUN-Off.
	Maximum	Minimum	Mean	
May.....	371	157	239	14,696
June.....	389	112	249	14,817
July.....	840	68	351	21,382
August.....	192	118	119	9,777
September (1 to 28).....	179	136	152	8,440
The period.....				69,312

## FISH CREEK NEAR PRIDDIS.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 26, Tp. 22, Rge. 3, W. 5th Mer., at the Percival ranch which is about one mile north of Priddis Post Office.

*Records available.*—May 13, 1907, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 91.24 feet during 1907–10. Zero elevation maintained at 90.81 feet during 1911–15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Not liable to shift except in extreme high water.

*Discharge measurements.*—By wading or from traffic bridge, about one mile upstream or from cable suspension bridge at the station.

*Winter flow.*—Observations discontinued during winter months.

*Flood.*—The largest recorded discharge at this station took place June 26, 1915, when the water elevation was 98.81 feet with an estimated flow of 7,056 sec.-ft.

*Observer.*—Fred Percival.

## DISCHARGE MEASUREMENTS of Fish Creek near Priddis, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 29.....	R. J. McGuinness.....	40.0	60.0	2.00	3.45	120.0
April 19.....	do.....	32.0	29.9	0.54	1.12	16.2
May 16.....	do.....	56.0	127.8	3.63	3.29	464.0
May 17.....	do.....	56.0	137.2	3.87	3.44	532.0
June 21.....	H. B. R. Thompson.....	44.0	90.2	2.84	2.55	257.0
June 26.....	do.....		737.2	9.57	8.00	7,056.0a
Aug. 5.....	do.....	36.0	52.5	2.50	2.32	131.0
Sept. 4.....	do.....	48.0	74.8	0.30	1.98	22.0
Oct. 6.....	do.....	48.5	56.0	1.35	2.36	75.0
Nov. 8.....	F. K. Beach.....	29.5	38.2	0.88	1.82	34.0

a Slope estimate.

## DAILY GAUGE HEIGHT AND DISCHARGE of Fish Creek near Priddis, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.13	377.0	1.30	22	1.88	58
2.....			3.13	377.0	1.31	22	2.15	93
3.....			3.38	490.0	1.80	52	3.51	553
4.....			3.37	486.0	2.10	86	3.00	324
5.....			3.17	395.0	1.80	52	2.78	243
6.....			2.74	230.0	1.81	53	2.62	192
7.....			2.72	223.0	1.66	41	2.66	204
8.....			1.25	20.0	1.65	40	2.68	210
9.....			1.25	20.0	1.54	32	2.67	207
10.....			1.17	17.4	1.53	32	2.43	145
11.....			1.15	17.0	1.47	29	2.32	122
12.....			1.12	16.4	1.42	26	2.33	124
13.....			1.16	17.2	1.37	25	2.36	130
14.....			1.16	17.2	3.00	324	2.34	126
15.....	4.34	1,102	1.17	17.4	4.15	952	2.44	147
16.....	4.37	1,126	1.16	17.2	3.41	505	2.40	138
17.....	4.64	1,356	1.16	17.2	3.44	519	2.40	138
18.....	4.84	1,540	1.14	16.8	3.65	629	3.06	348
19.....	4.64	1,356	1.14	16.8	3.41	505	2.99	320
20.....	4.66	1,374	1.14	16.8	3.39	495	2.93	297
21.....	4.65	1,365	1.12	16.4	3.06	348	2.65	201
22.....	4.55	1,275	1.11	16.2	3.06	348	2.43	145
23.....	4.00	846	1.08	15.6	3.00	324	2.34	126
24.....	4.02	860	1.21	18.4	2.63	195	2.24	107
25.....	3.80	718	1.21	18.4	2.74	230	2.23	105
26.....	3.75	688	1.16	17.2	2.63	195	8.00	7,020
27.....	3.70	658	1.13	16.6	2.47	153	5.00	1,710
28.....	3.50	548	1.13	16.6	2.46	151	5.00	1,710
29.....	3.47	534	1.10	16.0	2.16	94	4.00	846
30.....	3.30	452	1.10	16.0	2.13	90	3.00	324
31.....	3.19	404			1.95	66		



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Fish Creek near Priddis, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.00	324	3.89	774	1.96	67	2.35	128
2.....	2.80	250	3.59	595	1.96	67	2.26	111
3.....	3.46	529	2.93	297	2.01	73	2.47	153
4.....	3.37	486	2.87	275	1.96	67	2.45	149
5.....	3.28	443	2.37	132	2.52	165	2.38	134
6.....	3.34	471	2.53	165	2.54	170	2.36	131
7.....	3.27	439	2.55	173	2.54	170	2.33	124
8.....	3.54	569	2.70	216	2.72	223	2.24	107
9.....	3.50	548	2.44	147	2.48	156	2.24	107
10.....	3.14	382	2.36	130	2.53	168	2.24	107
11.....	2.99	320	2.13	90	2.47	153	2.35	128
12.....	2.84	264	1.99	71	2.28	114	2.35	128
13.....	2.84	264	2.17	96	2.26	111	2.32	122
14.....	5.84	2,760	2.26	111	2.26	111	2.32	122
15.....	4.82	1,520	2.06	80	2.25	109	2.25	109
16.....	4.06	888	1.89	59	2.17	96	2.21	102
17.....	5.35	2,120	2.16	94	2.14	92	2.72	223
18.....	4.95	1,655	2.07	82	2.05	79	2.72	223
19.....	4.29	1,062	2.28	114	2.05	79	2.69	213
20.....	3.93	800	2.94	301	2.37	132	2.72	223
21.....	3.83	737	2.91	290	2.24	107	2.24	107
22.....	3.60	600	3.02	332	2.17	96	2.16	94
23.....	3.35	476	2.72	223	2.18	97	2.14	92
24.....	3.62	612	2.64	198	3.02	332	2.14	92
25.....	3.40	500	2.55	173	2.98	316	2.12	89
26.....	3.36	481	2.44	147	2.84	264	2.12	89
27.....	3.13	377	2.29	116	2.56	176	2.07	82
28.....	3.84	743	2.28	114	2.46	151	2.07	82
29.....	3.84	743	2.27	113	2.38	134	1.96	67
30.....	2.70	216	2.25	109	2.38	134	1.94	65
31.....	3.33	466	2.01	73			1.94	65

## MONTHLY DISCHARGE of Fish Creek near Priddis, for 1915.

(Drainage area 109 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Acre-feet.
March (15-31).....	1,540	404 0	953	8.743	5.53	32,134
April.....	490	15 6	99	0.908	1.01	5,890
May.....	952	22 0	214	1.963	2.26	13,158
June.....	7,020	58 0	547	5.018	5.60	33,549
July.....	2,760	216 0	711	6.523	7.52	43,718
August.....	774	59 0	190	1.743	2.01	11,682
September.....	332	67 0	140	1.284	1.43	8,160
October.....	223	65 0	122	1.119	1.29	7,401
The period.....					26.65	144,962

## NORTH BRANCH OF SHEEP RIVER NEAR MILLARVILLE.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 12, Tp. 21, Rge. 3, W. 5th Mer., at Malcolm T. Miller's ranch*Records available.*—May 22, 1908, to November 13, 1915.*Gauge.*—Vertical staff. Elevation of zero maintained at 3,822.67 feet during 1908-10. Elevation of zero maintained at 3,821.40 feet during 1911-15.*Bench-mark.*—Permanent iron bench-mark. Elevation 3,838.73, not 3,821.40 as given in the 1914 report (Dominion Western Railway datum), located 36 feet southwest of the N.E. corner of Sec. 2, Tp. 21, Rge. 3, W. 5th Mer., and about 300 feet west of the gauge.

*Discharge measurements.*—Made at the traffic bridge about one mile downstream on the road allowance on the east boundary of Sec. 12 or at a wading section, 200 feet downstream from the gauge.

*Winter flow.*—Observations not taken during winter months.

*Flood.*—The largest flood at this station of record took place on June 26, 1915, when the water level was 3,749.13 feet with a discharge of 5,621 second-feet.

*Diversions.*—The headgates of Malcolm T. Miller's irrigation ditch are about two miles above station. To date this ditch has not been used.

*Observer.*—Malcolm T. Miller.

DISCHARGE MEASUREMENTS of North Branch of Sheep River near Millarville, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 29.....	R. J. McGuinness.....	35	16.5	1.04	2.24	17.2
April 16.....	do.....	28	22.8	1.60	2.53	36.0
May 12.....	do.....	77	58.2	3.31	3.22	193.0
June 19.....	H. B. R. Thompson.....	101	335.0	2.34	4.35	786.0
June 26.....	do.....	.....	918.5	6.12	10.40	5,621.0 <sup>a</sup>
Aug. 6.....	do.....	83	211.2	0.935	3.22	197.0
Sept. 3.....	do.....	105	179.9	0.111	2.56	20.0
Oct. 1.....	do.....	37	55.2	1.86	2.92	103.0
Nov. 6.....	F. K. Beach.....	111	148.6	0.20	2.49	30.0

<sup>a</sup> Slope estimate.

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Sheep River near Millarville, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.11	2.4	2.88	94	3.42	266
2.....			2.31	12.8	3.38	250	3.89	495
3.....			2.41	21.0	3.58	337	3.82	457
4.....			2.57	40.0	3.37	247	3.85	473
5.....			2.50	32.0	3.39	254	4.05	587
6.....			2.40	20.0	3.37	247	3.92	512
7.....			2.43	24.0	3.60	346	4.12	628
8.....			2.50	32.0	3.64	365	4.15	647
9.....			2.33	14.4	3.62	356	3.90	500
10.....			2.43	24.0	3.50	300	3.75	420
11.....			2.43	24.0	3.37	247	3.68	384
12.....			2.48	30.0	3.26	206	3.75	420
13.....			2.52	34.0	3.26	206	3.87	484
14.....			2.52	34.0	5.23	1,334	4.06	593
15.....	2.12	2.8	2.53	36.0	4.59	939	3.95	529
16.....	2.65	52.0	2.58	42.0	4.30	744	3.83	462
17.....	2.88	94.0	2.58	42.0	4.33	764	4.15	647
18.....	2.94	108.0	2.62	47.0	4.41	817	4.35	777
19.....	2.72	64.0	2.61	46.0	4.13	635	4.40	810
20.....	2.92	103.0	2.59	43.0	3.96	535	4.30	744
21.....	2.82	82.0	2.58	42.0	3.96	535	3.90	500
22.....	2.82	82.0	2.55	38.0	3.84	468	3.80	446
23.....	2.72	64.0	2.53	36.0	4.11	622	3.70	394
24.....	2.47	28.0	2.58	42.0	4.19	672	3.55	323
25.....	2.27	10.2	2.55	38.0	4.37	790	3.68	384
26.....	2.27	10.2	2.53	36.0	4.36	784	6.15	2,123
27.....	2.27	10.2	2.51	33.0	4.28	731	4.50	878
28.....	2.37	17.6	2.48	30.0	4.03	575	4.30	744
29.....	2.19	5.6	2.48	30.0	3.81	451	4.00	558
30.....	2.22	7.2	2.57	40.0	3.68	384	3.40	258
31.....	2.12	2.8			3.61	351		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Sheep River near Millarville, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.60	346	4.00	558	2.58	42	2.95	111	2.67	55
2.....	3.00	124	3.70	394	2.57	40	2.93	106	2.60	44
3.....	3.00	124	3.55	323	2.57	40	3.05	138	2.57	40
4.....	3.00	124	3.35	239	2.55	38	2.98	119	2.63	49
5.....	2.95	111	3.30	220	2.50	32	2.97	116	2.54	37
6.....	2.95	111	3.26	206	2.50	32	2.95	111	2.49	31
7.....	2.62	47	3.18	178	2.95	111	2.85	88	2.40	20
8.....	3.10	152	3.15	168	2.92	103	2.85	88	2.40	20
9.....	2.80	78	3.08	146	2.82	82	2.84	86	2.42	22
10.....	2.70	60	3.08	146	2.82	82	2.86	90	2.35	16
11.....	2.50	32	2.95	111	2.75	69	2.94	108	2.32	13.6
12.....	2.40	20	2.94	108	2.75	69	2.96	114	2.32	13.6
13.....	3.15	168	2.98	119	2.75	69	2.89	96	2.35	16
14.....	5.25	1,400	2.98	119	2.75	69	2.89	96		
15.....	4.70	1,014	2.83	84	2.75	69	2.86	90		
16.....	5.70	1,760	2.80	78	2.75	69	2.83	84		
17.....	5.00	1,220	2.75	69	2.74	67	2.80	78		
18.....	4.50	878	2.85	88	2.74	67	2.81	80		
19.....	4.30	744	2.82	82	2.75	69	2.81	80		
20.....	4.30	744	3.35	239	2.75	69	2.81	80		
21.....	4.00	558	3.18	178	2.74	67	2.80	78		
22.....	3.50	300	3.01	127	2.73	65	2.77	73		
23.....	3.25	202	2.93	106	2.85	88	2.77	73		
24.....	3.20	184	2.86	90	3.29	216	2.77	73		
25.....	3.20	184	2.81	80	3.30	220	2.73	65		
26.....	3.20	184	2.76	71	3.25	202	2.73	65		
27.....	4.50	878	2.71	62	3.15	168	2.73	65		
28.....	4.50	878	2.69	58	3.05	138	2.72	64		
29.....	4.35	777	2.61	46	3.02	130	2.71	62		
30.....	4.00	558	2.61	46	3.02	130	2.68	57		
31.....	3.85	473	2.58	42			2.68	57		

## MONTHLY DISCHARGE of North Branch of Sheep River near Millarville, for 1915.

(Drainage area 199 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (15-31).....	108	2 8	44	0 221	0 14	1,483
April.....	47	2 4	32	0 161	0 18	1,904
May.....	1,384	94 0	504	2 532	2 92	30,990
June.....	2,123	206 0	581	2 920	3 26	34,572
July.....	1,760	20 0	466	2 340	2 70	28,653
August.....	558	42 0	148	0 744	0 86	9,160
September.....	220	32 0	90	0 454	0 51	5,125
October.....	138	57 0	87	0 437	0 59	5,849
November (1-13).....	85	13 6	29	0 146		748
The period.....					11 14	188,184

## SOUTH BRANCH OF SHEEP RIVER AT BLACK DIAMOND.

*Location.*—On steel highway bridge on road allowance between Secs. 8 and 17, Tp. 20, Rge. 2, W. 5th Mer., about one-half mile from Black Diamond post office.

*Records available.*—From May 23, 1908, to October 31, 1915.

*Gauge.*—Standard chain gauge. Zero elevation maintained at 93.66 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made from traffic bridge or by wading.

*Winter flow.*—No observations taken during winter months.

*Flood.*—The highest recorded flow of this stream occurred June 26, 1915, when the water elevation at this stage was 99.16 feet with an estimated discharge of 5,125 second-feet.

*Observer.*—H. A. Arnold.

## DISCHARGE MEASUREMENTS of South Branch of Sheep River at Black Diamond, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 29.....	R. J. McGuinness.....	60.0	58.5	0.75	0.46	44.0
April 16.....	do.....	72.0	74.5	1.14	0.73	85.0
May 12.....	do.....	101.6	189.5	2.86	1.61	542.0
June 19.....	H. B. R. Thompson.....	112.5	295.0	5.23	2.70	1,543.0
June 26.....	do.....	.....	593.9	8.63	5.50	5,125.0a
Aug. 4.....	do.....	90.0	156.2	3.48	1.53	543.0
Sept. 3.....	do.....	84.0	86.7	2.22	0.74	193.0
Oct. 1.....	do.....	86.0	109.8	2.47	0.96	272.0
Nov. 6.....	F. K. Beach.....	71.5	65.0	1.67	0.26	109.0

a Slope estimate.

## DAILY GAUGE HEIGHT AND DISCHARGE of South Branch of Sheep River at Black Diamond, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.56	56	1.66	560	2.20	1,032
2.....			0.72	84	1.90	760	2.40	1,228
3.....			0.97	152	1.65	552	2.40	1,228
4.....			0.85	116	1.40	364	2.35	1,178
5.....			0.79	100	1.59	358	2.45	1,278
6.....			0.73	87	1.48	418	2.40	1,228
7.....			0.72	84	1.70	592	2.44	1,268
8.....			0.70	80	1.97	822	2.48	1,308
9.....			0.58	59	2.22	1,051	2.37	1,198
10.....			0.56	56	1.96	813	2.18	1,014
11.....			0.56	56	1.86	725	2.16	995
12.....			0.57	57	1.75	632	2.13	968
13.....			0.73	87	1.79	664	2.42	1,248
14.....			0.73	87	2.10	940	2.95	1,810
15.....			0.68	76	2.20	1,032	2.41	1,238
16.....			0.81	105	2.25	1,080	2.39	1,218
17.....			0.84	113	2.25	1,080	2.55	1,379
18.....			0.83	110	2.20	1,032	2.74	1,577
19.....			0.85	116	2.20	1,032	2.95	1,810
20.....			0.88	124	2.15	986	2.90	1,750
21.....	0.77	95	0.77	95	2.10	940	2.85	1,695
22.....	0.79	106	0.69	78	2.25	1,080	2.80	1,640
23.....	0.87	122	0.70	80	2.30	1,128	2.64	1,472
24.....	0.79	100	0.71	82	2.30	1,128	2.39	1,218
25.....	0.62	66	0.68	76	2.55	1,379	2.44	1,268
26.....	0.56	56	0.72	84	2.70	1,534	5.19	4,686
27.....	0.56	56	0.79	100	2.65	1,482	3.73	2,759
28.....	0.56	56	0.83	110	2.60	1,430	3.23	2,146
29.....	0.56	56	0.93	140	2.57	1,399	2.69	1,524
30.....	0.57	57	1.32	316	2.50	1,328	2.51	1,346
31.....	0.57	57	.....	.....	2.35	1,178	.....	.....

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of South Branch of Sheep River at Black Diamond, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.46	1,298	1.92	816	0.74	194	0.90	240
2.....	2.28	1,126	1.86	770	0.86	227	0.95	255
3.....	2.22	1,070	1.74	681	0.73	191	0.97	265
4.....	2.45	1,288	1.60	584	0.65	172	0.92	247
5.....	2.21	1,061	1.53	541	0.65	172	0.89	237
6.....	2.12	980	1.41	468	0.64	170	0.83	213
7.....	2.23	1,080	1.35	435	0.90	240	0.76	195
8.....	2.21	1,061	1.33	424	0.76	198	0.74	194
9.....	2.00	878	1.27	394	0.83	218	0.75	196
10.....	1.70	652	1.20	360	0.80	208	0.76	198
11.....	1.66	625	1.14	334	0.75	196	0.71	186
12.....	1.60	584	1.11	320	0.75	196	0.70	184
13.....	1.59	578	1.30	408	0.69	182	0.70 <sup>d</sup>	184
14.....	2.85	1,695	1.15	338	0.70	184	0.71	186
15.....	2.28	1,126	1.31	413	0.73	191	0.64	170
16.....	2.88	1,728	1.16	342	0.75	196	0.64	170
17.....	2.44	1,278	1.18 <sup>d</sup>	351	0.74	194	0.64	170
18.....	2.59	1,424	1.20	360	0.80	208	0.66	174
19.....	2.42	1,259	1.16	342	0.88	234	0.70	184
20.....	2.25	1,098	1.40	462	0.86	227	0.65	172
21.....	2.15	1,007	1.26	389	0.82	214	0.66	174
22.....	2.02	895	1.20	360	0.85	224	0.62	165
23.....	1.93	823	1.11	320	0.97	265	0.61	162
24.....	1.80	724	1.01	280	1.20	360	0.61	162
25.....	1.77	702	1.01	280	1.14	334	0.61	162
26.....	1.82	739	0.96	262	1.12	325	0.62	165
27.....	1.71	659	0.90	240	1.05	296	0.61	162
28.....	2.41	1,250	0.85	224	1.05	296	0.55	150
29.....	2.21	1,061	0.81	211	1.00	276	0.58	156
30.....	2.05	920	0.75	196	0.95	258	0.60	160
31.....	1.96	847	0.74	194	.....	.....	0.54	148

<sup>d</sup> Gauge height interpolated.

## MONTHLY DISCHARGE of South Branch of Sheep River at Black Diamond, for 1915.

(Drainage area 248 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31)...	122	56	75	0 302	0.12	1,636
April.....	316	56	99	0 399	0.45	5,890
May.....	1,534	358	952	3 840	4.43	58,535
June.....	4,686	968	1,524	6 140	6.85	90,684
July.....	1,728	578	1,017	4 100	4.73	62,533
August.....	816	194	390	1 570	1.81	28,980
September.....	360	170	228	0 919	1.03	13,567
October.....	265	148	187	0 754	0.87	11,498
The period...	.....	.....	.....	.....	20.29	268,324

## SHEEP RIVER NEAR OKOTOKS.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 22, Tp. 20, Rge. 29, W. 4th Mer., at the Canadian Pacific Railway Company's bridge about one mile southeast of Okotoks.*Records available.*—From May 7, 1909, to October 31, 1915.*Gauge.*—Chain. Previous to 1915 a vertical staff. The elevation of the zero has been maintained at 3,417.12 feet during 1912-15. High water staff gauge is imbedded in the cement on centre pier. Elevation of the zero maintained at 3,419.12 feet during 1912-15.*Bench-mark.*—Top of the left abutment at southwest corner. Elevation, 3,431.57 feet above mean sea level. (C.P.R. datum.)

*Channel.*—Shifting.

*Discharge measurements.*—From bridge or by wading.

*Winter flow.*—Observations discontinued during winter months.

*Artificial control.*—Gas pipes crossing river below gauging section form good control.

*Floods.*—The highest recorded discharge in recent years of this stream occurred June 26, 1915, when the water level at this station was 3,427.92, with an estimated discharge of 21,394 sec.-ft. Considerable damage was done to property in the town of Okotoks and the gas main at the station was carried away. Floods also occurred on this stream in 1899 and 1902, and a flood with an estimated discharge of 22,230 sec.-ft. occurred some time previous to 1894 according to old records in this office.

*Observer.*—Miss M. B. Henderson.

#### DISCHARGE MEASUREMENTS of Sheep River near Okotoks, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 27.....	R. J. McGuinness.....	93 0	258.0	0.34	2.17	88
April 15.....	do.....	98 0	268.0	0.46	2.35	124
May 11.....	do.....	118 0	409.2	2.57	3.65	1,042
June 18.....	H. B. R. Thompson.....	164.0	432.0	4.83	4.78	2,068
June 26.....	do.....	.....	2321.5	9.21	10.80	21,394 <sup>a</sup>
June 27.....	do.....	283.0	789.0	6.24	5.50	4,922
Aug. 2.....	do.....	179.5	448.3	4.10	4.45	1,837
Sept. 2.....	do.....	123.0	212.5	1.61	3.23	343
Sept. 30.....	do.....	119.5	269.4	2.06	3.48	556
Nov. 5.....	F. K. Beach.....	126 0	209.2	1.17	3.05	245

<sup>a</sup> Slope estimate.

#### DAILY GAUGE HEIGHT AND DISCHARGE of Sheep River near Okotoks, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.15	92	2.83	301	3.90	1,150
2.....			2.18 <sup>d</sup>	97	3.30	605	4.25	1,565
3.....			2.20	100	3.28 <sup>d</sup>	590	4.25	1,565
4.....			2.40	135	3.25	568	4.28 <sup>d</sup>	1,604
5.....			2.38 <sup>d</sup>	131	3.30	605	4.30	1,630
6.....			2.37	129	3.48 <sup>d</sup>	753	4.36 <sup>d</sup>	1,714
7.....			2.35	125	3.65	905	4.42	1,800
8.....			2.35	125	4.00	1,260	4.32	1,658
9.....			2.35	125	4.15	1,440	4.32	1,658
10.....			2.32 <sup>d</sup>	119	3.90 <sup>d</sup>	1,150	4.02	1,284
11.....			2.30	115	3.65	905	4.08 <sup>d</sup>	1,356
12.....			2.30	115	3.46	736	4.13 <sup>d</sup>	1,416
13.....			2.30	115	3.49	761	4.19	1,488
14.....			2.30	115	5.11	2,979	4.29	1,617
15.....			2.35	125	4.61	2,086	4.34	1,686
16.....			2.37	129	4.47	1,875	4.35	1,700
17.....	3.31	100 <sup>c</sup>	2.40	135	4.37	1,728	4.50	1,920
18.....	3.34	125	2.40	135	4.27 <sup>d</sup>	1,591	4.75	2,315
19.....	3.19	150	2.40 <sup>d</sup>	135	4.17 <sup>d</sup>	1,464	5.00	2,770
20.....	3.24	175	2.40	135	4.10 <sup>d</sup>	1,380	4.70	2,230
21.....	3.34	200 <sup>c</sup>	2.45	150	4.03	1,296	4.40	1,770
22.....	2.84	307 <sup>a</sup>	2.40 <sup>d</sup>	135	4.13	1,416	4.35	1,700
23.....	2.69	236	2.35	125	4.23	1,539	4.35	1,700
24.....	2.59	196	2.35	125	4.38	1,742	4.30	1,630
25.....	2.56	186	2.35	125	4.63	2,118	4.32	1,658
26.....	2.45 <sup>d</sup>	150	2.35 <sup>d</sup>	125	4.44	1,830	10.80	21,390 <sup>d</sup>
27.....	2.34	123	2.35	125	4.42 <sup>d</sup>	1,800	7.80	10,950 <sup>b</sup>
28.....	2.24	106	2.35 <sup>d</sup>	125	4.39	1,756	6.50	6,850
29.....	2.24	106	2.35	125	4.22 <sup>d</sup>	1,526	5.20	3,330
30.....	2.14	91	2.35	125	4.04	1,308	3.94	1,032
31.....	2.09	84	.....	.....	3.97 <sup>d</sup>	1,227	.....	.....

*a-a* Curve No. 1.

*b-b* Curve No. 2.

*c-c* Ice conditions, discharges estimated.

*d* Interpolated gauge height.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sheep River near Okotoks, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.04	1,166	4.70	2,300	3.23	356	3.45	520
2.....	3.79	849	4.50	1,920	3.23	356	3.45	520
3.....	3.79	849	4.20	1,400	3.23	356	3.50	560
4.....	3.79	849	4.10	1,250	3.18	322	3.47	536
5.....	3.79	849	4.00	1,110	3.18	322	3.45	520
6.....	3.64	690	3.90	980	3.17	315	3.35	442
7.....	3.87	944	3.90	980	3.55	605	3.30	405
8.....	3.99	1,097	3.85	920	3.40	480	3.30	405
9.....	3.89	968	3.70	750	3.40	480	3.30	405
10.....	3.79	849	3.65	700	3.35	442	3.30	405
11.....	3.44	512	3.55	605	3.30	405	3.30	405
12.....	3.14	296	3.50	560	3.30	405	3.30	405
13.....	3.24	363	3.65	700	3.25	370	3.30	405
14.....	8.00	11,600	3.64	690	3.25	370	3.30	405
15.....	8.00	11,600	3.59	641	3.25	370	3.25	370
16.....	10.00	18,500	3.59	641	3.25	370	3.25	370
17.....	8.50	13,350	3.54	596	3.25	370	3.25	370
18.....	8.00	11,600	3.64	690	3.25	370	3.25	370
19.....	7.70	10,600	3.64	690	3.25	370	3.23	356
20.....	7.30	9,350	4.42	1,776	3.27	384	3.23	356
21.....	4.54	1,992	4.09	1,236	3.30	405	3.20	335
22.....	4.90	2,700	3.64	690	3.45	520	3.20	335
23.....	4.45	1,830	3.59	641	3.50	560	3.18	322
24.....	4.50	1,920	3.54	596	3.80	860	3.15	303
25.....	4.40	1,940	3.44	512	3.85	920	3.15	303
26.....	4.45	1,830	3.43	504	3.65	700	3.15	303
27.....	4.35	1,650	3.43	504	3.60	650	3.15	303
28.....	5.60	4,250	3.38	465	3.45	520	3.15	303
29.....	5.00	2,900	3.33	428	3.45	520	3.10	270
30.....	4.70	2,300	3.28	391	3.45	520	3.10	270
31.....	4.45	1,830	3.28	391	.....	.....	3.10	270

b-b Curve No. 2.

## MONTHLY DISCHARGE of Sheep River near Okotoks, for 1915.

(Drainage area 632 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (17-31).....	307	84	156	0.247	0.14	4,642
April.....	150	92	124	0.196	0.22	7,379
May.....	2,979	301	1,330	2.104	2.43	81,780
June.....	21,390	1,032	2,871	4.543	5.07	170,840
July.....	18,500	296	3,920	6.203	7.15	241,130
August.....	2,300	391	847	1.340	1.54	52,080
September.....	920	315	466	0.737	0.82	27,709
October.....	560	270	382	0.604	0.70	22,488
The period.....	.....	.....	.....	.....	18.07	608,968

## HIGHWOOD RIVER AT BROWN'S RANCH

*Location.*—On SE. 1 Sec. 20, Tp. 18, Rge. 2, W. 5th Mer., at B. F. Brown's ranch, about eight miles north of Pekisko and five miles west of Longview Post Office.

*Records available.*—July 27, 1912, to October 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero maintained at 93.90 feet during 1912. Elevation of zero maintained at 91.97 feet during 1913-15.



*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Shifts during floods.

*Discharge measurements.*—Made from the traffic bridge one and one-half miles downstream or by wading near bridge.

*Winter flow.*—Observations discontinued during winter months.

*Flood.*—The highest flood of which records are available took place June 26, 1915, when the water level was 97.97 feet with a discharge of 7,516 sec.-ft.

*Observer.*—B. F. Brown

#### DISCHARGE MEASUREMENTS of Highwood River at Brown's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 22.....	R. J. McGuinness.....	118.0	149.2	2.86	1.13	426
May 21.....	do.....	192.0	394.4	3.58	2.12	1,414
June 25.....	H. B. R. Thompson.....	190.0	448.0	5.31	2.65	2,416
June 26.....	do.....	188.5	946.0	7.94	6.00	7,516 <sup>a</sup>
July 3.....	do.....	148.0	437.0	5.71	2.78	2,494
Aug. 11.....	do.....	148.0	205.9	3.00	1.42	617
Sept. 13.....	do.....	120.5	142.6	2.23	1.05	318
Oct. 9.....	do.....	120.5	144.5	2.27	1.06	328
Nov. 12.....	F. K. Beach.....	69.0	67.6	2.46	0.59	166

<sup>a</sup> Slope estimate.

#### DAILY GAUGE HEIGHT AND DISCHARGE of Highwood River at Brown's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.31	509	1.73	936	2.40	1,890
2.....			1.38	572	2.04	1,356	2.45	1,965
3.....			1.33	527	1.99	1,286	2.50	2,040
4.....			1.48	670	1.94	1,216	2.45	1,965
5.....			1.68	878	1.79	1,008	2.50	2,040
6.....			1.83	1,062	1.89	1,146	2.55	2,115
7.....			2.13	1,485	1.99	1,286	2.55	2,115
8.....			2.04	1,356	2.39	1,875	2.65	2,265
9.....			2.00	1,300	2.69	2,325	2.50	2,040
10.....			1.13	381	2.49	2,025	2.45	1,965
11.....			0.83	232	2.39	1,875	2.60	2,190
12.....			0.81	227	2.19	1,575	2.75	2,415
13.....			0.88	245	2.14	1,500	2.80	2,490
14.....	1.68	878	0.85	237	2.99	2,775	2.90	2,640
15.....	1.68	878	0.88	245	2.49	2,025	3.00	2,790
16.....	1.73	936	0.97	285	2.29	1,725	3.10	2,940
17.....	1.63	823	1.08	348	2.34	1,800	3.15	3,015
18.....	1.71	912	1.18	416	2.29	1,725	3.20	3,090
19.....	1.73	936	1.28	486	2.24	1,650	3.25	3,165
20.....	1.76	972	1.29	493	2.19	1,575	3.00	2,790
21.....	1.78	996	1.18	416	2.12	1,470	2.90	2,640
22.....	1.83	1,062	1.13	381	2.08	1,412	2.80	2,490
23.....	1.88	1,132	1.08	348	2.15	1,515	2.75	2,415
24.....	1.43	620	0.98	290	2.35	1,815	2.65	2,265
25.....	1.33	527	0.98	290	2.50	2,040	2.70	2,340
26.....	1.28	486	0.98	290	2.65	2,265	6.00	7,540
27.....	1.31	509	0.98	290	2.65	2,265	4.10	4,500
28.....	1.28	486	0.96	280	2.60	2,190	3.50	3,540
29.....	1.18	416	1.33	527	2.70	2,340	3.20	3,090
30.....	1.23	451	1.68	878	2.65	2,265	3.00	2,790
31.....	1.28	486			2.45	1,965		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood River at Brown's Ranch for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.30	3,240	1.98	1,272	1.04	324	1.20	430
2.....	3.20	3,090	1.95	1,230	1.03	318	1.15	395
3.....	2.80	2,490	1.93	1,202	1.03	318	1.10	360
4.....	2.65	2,265	1.90	1,160	1.01	306	1.12	374
5.....	2.65	2,265	1.75	960	1.01	306	1.10	360
6.....	2.63	2,235	1.70	900	1.01	306	1.08	348
7.....	2.70	2,340	1.60	790	1.11	367	1.05	330
8.....	2.60	2,190	1.55	740	1.06	336	1.03	318
9.....	2.50	2,040	1.50	690	1.11	367	1.02	312
10.....	2.30	1,740	1.45	640	1.06	336	1.00	300
11.....	2.10	1,440	1.42	610	1.03	318	1.08	348
12.....	2.05	1,370	1.40	590	1.01	306	1.04	324
13.....	1.90	1,160	1.45	640	1.06	336	1.00	300
14.....	2.35	1,815	1.35	545	1.03	318	0.96	280
15.....	2.15	1,515	1.35	545	1.00	300	0.95	275
16.....	2.05	1,370	1.40	590	1.00	300	0.97	285
17.....	2.03	1,342	1.35	545	1.00	300	1.00	300
18.....	2.20	1,590	1.40	590	0.98	290	1.05	330
19.....	2.03	1,342	1.45	640	0.96	280	1.00	300
20.....	1.95	1,230	1.40	590	0.97	285	0.98	290
21.....	1.90	1,160	1.38	572	1.00	300	0.95	275
22.....	1.85	1,090	1.28	486	1.08	348	1.00	300
23.....	1.83	1,062	1.25	465	1.25	465	0.98	290
24.....	1.80	1,020	1.20	430	1.28	486	0.95	275
25.....	2.25	1,665	1.15	395	1.25	465	0.95	275
26.....	2.10	1,440	1.12	374	1.20	430	0.93	265
27.....	1.90	1,160	1.10	360	1.20	430	0.90	250
28.....	2.40	1,890	1.08	348	1.22	444	0.90	250
29.....	2.25	1,665	1.05	330	1.18	416	0.88	245
30.....	2.10	1,440	1.05	330	1.15	395	0.90	250
31.....	2.00	1,300	1.03	318			0.95	275

## MONTHLY DISCHARGE of Highwood River at Brown's Ranch, for 1915.

(Drainage area 421 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (14-31).....	1,132	416	750	1.781	1.19	26,777
April.....	1,485	227	531	1.261	1.41	31,597
May.....	2,775	936	1,749	4.154	4.78	107,543
June.....	7,540	1,890	2,718	6.456	7.21	161,732
July.....	3,240	1,020	1,708	4.057	4.68	105,021
August.....	1,272	318	641	1.523	1.75	39,414
September.....	486	280	350	0.831	0.93	20,826
October.....	430	245	307	0.729	0.84	18,877
The period.....					22.79	511,786

## PEKIKO CREEK AT PEKIKO

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 8, Tp. 17, Rge. 2, W. 5th Mer., at George Lane's Bar U ranch, and about twenty-five miles southwest of High River.

*Records available.*—October 6, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero of gauge is 93.90 feet, which has been unchanged since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent.

*Discharge measurements.*—Made from a small suspension foot-bridge or by wading.

*Winter flow.*—Observations not taken during winter months.

*Diversions.*—The headgates of George Lane's irrigation ditch are about one and one-half miles upstream from station.

*Observer.*—F. R. Pike.

# DISCHARGE MEASUREMENTS of Pekisko Creek at Pekisko, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 1.....	R. J. McGuinness.....	39.0	24.3	0.57	1.15	14.0
April 21.....	do.....	41.0	30.8	1.21	1.39	37.6
May 20.....	do.....	54.0	128.9	1.76	2.28	227.0
June 24.....	H. B. R. Thompson.....	43.0	140.0	1.76	2.25	246.0
June 26.....	do.....	.....	254.0	2.74	4.00	696.0 <sup>a</sup>
Aug. 9.....	do.....	58.5	51.6	1.44	1.53	75.0
Sept. 11.....	do.....	54.5	44.5	1.01	1.33	45.0
Oct. 9.....	do.....	54.5	47.5	1.01	1.34	48.0

<sup>a</sup> Slope estimate.

# DAILY GAUGE HEIGHT AND DISCHARGE of Pekisko Creek at Pekisko, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.16	15	1.96	141	2.04	160
2.....	1.24	20	2.34	238	2.24	212
3.....	1.29	27	2.23	210	2.15	189
4.....	1.31	29	2.15	189	2.11	179
5.....	1.30	28	2.21	205	2.25	215
6.....	1.29	27	2.12	181	2.18	197
7.....	1.28	26	2.20	202	2.28	223
8.....	1.27	25	2.28	223	2.24	212
9.....	1.26	24	2.26	218	2.14	186
10.....	1.25	23	2.17	194	2.11	179
11.....	1.25	23	2.05	163	2.12	181
12.....	1.25	23	1.95	139	2.15	189
13.....	1.30 <sup>d</sup>	28	2.02	155	2.15	189
14.....	1.35	33	2.76	353	2.26	218
15.....	1.35	33	2.59	306	2.40	254
16.....	1.36	35	2.41	257	2.42	259
17.....	1.37	36	2.36	244	2.44	265
18.....	1.40	39	2.31	231	2.64	320
19.....	1.40	39	2.31	231	2.96	409
20.....	1.40 <sup>d</sup>	39	2.28	223	2.74	348
21.....	1.39	38	2.38	249	2.56	298
22.....	1.39 <sup>d</sup>	38	2.35	241	2.45	268
23.....	1.39	38	2.49	279	2.36	244
24.....	1.37	36	2.65	323	2.28	223
25.....	1.35	33	2.64	320	2.38	249
26.....	1.35	33	2.58	304	3.84	652
27.....	1.35	33	2.45	268	3.20	483
28.....	1.35	33	2.39	251	2.85	390
29.....	1.35	33	2.32	233	2.59	320
30.....	1.40	39	2.20	202	2.36	260
31.....	.....	.....	2.14	186	.....	.....

<sup>d</sup> Gauge height interpolated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Pekisko Creek at Pekisko, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.46	286	1.85	137	.....	.....	1.34	48
2.....	2.26	235	1.82	130	.....	.....	1.35	49
3.....	2.26	235	1.95	159	.....	.....	1.41	57
4.....	2.12	200	1.79	124	.....	.....	1.36	50
5.....	2.05	182	1.72	110	.....	.....	1.34	48
6.....	2.01	172	1.65	97	.....	.....	1.39	55
7.....	2.05	182	1.64	95	.....	.....	1.39	55
8.....	1.96	161	1.64	95	.....	.....	1.37	52
9.....	1.86	139	1.53	75	.....	.....	1.34	48
10.....	1.90	148	1.54	77	1.34	48	1.38	53
11.....	1.77	120	.....	.....	1.33	46	1.36	50
12.....	1.72	110	.....	.....	1.32	45	1.38	53
13.....	1.71	108	.....	.....	1.30	42	1.38	53
14.....	2.06	185	.....	.....	1.28	40	1.39	55
15.....	1.84	135	.....	.....	1.26	37	1.39	55
16.....	1.82	130	.....	.....	1.24	35	1.39	55
17.....	1.94	157	.....	.....	1.23	34	1.39	55
18.....	2.02	175	.....	.....	1.23	34	1.39	55
19.....	1.84	135	.....	.....	1.27	38	1.41	57
20.....	1.84	135	.....	.....	1.24	35	1.41	57
21.....	1.72	110	.....	.....	1.23	34	1.38	52
22.....	1.71	108	.....	.....	1.21	31	1.38	53
23.....	1.65	97	.....	.....	1.31	43	1.37	52
24.....	1.65	97	.....	.....	1.53	75	1.37	52
25.....	1.65	97	.....	.....	1.47	66	1.36	50
26.....	1.79	124	.....	.....	1.39	55	1.36	50
27.....	1.70	106	.....	.....	1.42	59	1.36	50
28.....	2.18	215	.....	.....	1.39	55	1.33	46
29.....	2.12	200	.....	.....	1.39	55	1.33	46
30.....	2.07	187	.....	.....	1.35	49	1.35	49
31.....	1.95	159	.....	.....	.....	.....	1.35	49

a to b No gauge height observations available.

## MONTHLY DISCHARGE of Pekisko Creek at Pekisko, for 1915.

(Drainage area 99 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	39	15	31	0.313	0.35	1,845
May.....	353	139	231	2.353	2.69	14,204
June.....	652	160	266	2.687	3.00	15,828
July.....	286	97	156	1.576	1.82	9,592
August (1-10).....	159	75	110	1.111	0.41	2,182
September (10-30).....	75	31	46	0.465	0.36	1,916
October.....	57	46	52	0.525	0.61	3,193
The period.....	.....	.....	.....	.....	9.24	48,765

## STIMSON CREEK NEAR PEKISKO.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 2, Tp. 17, Rge. 2, W. 5th Mer., at E. R. Baker's ranch, about three miles east of Pekisko post office.

*Records available.*—From October 6, 1911, to October 9, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 90.20 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

Channel.—Fairly permanent.

Discharge measurements.—By wading or from bridge.

Winter flow.—No observations taken during winter months.

Flood.—The flood of 1915 was the greatest of which records are available. On June 26, 1915, the gauge height was 6.97 feet with an estimated discharge of 1,726 second-feet.

Remarks.—The observations of gauge heights at this station were for broken periods only as no observer was available for part of the time.

Observer.—E. R. Baker.

# DISCHARGE MEASUREMENTS of Stimson Creek near Pekisko, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 1.....	R. J. McGuinness.....	50.0	36.5	0.93	1.85	34.0
April 21.....	do.....	19.0	7.6	1.30	1.42	9.8
May 20.....	do.....	37.5	109.1	2.07	3.09	276.0
June 24.....	H. B. R. Thompson.....	66.0	99.3	2.99	2.70	297.0
June 26.....	do.....	283.0	6.10	6.97	17,260.0a	
Aug. 9.....	do.....	32.6	41.7	1.01	1.95	42.0
Sept. 11.....	do.....	35.0	42.0	0.68	1.83	29.0
Oct. 9.....	do.....	31.0	37.1	0.71	1.79	26.0

a Slope estimate.

# DAILY GAUGE HEIGHT AND DISCHARGE of Stimson Creek near Pekisko, for 1915.

DAY.	March.		April.		May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.85	35.0	1.53	8			3.35	418	2.73	210
2.....			1.75	25.0	2.43	133			3.30	400	2.75	216
3.....			1.73	23.0	2.48	145			3.20	365	2.71	205
4.....			1.80	30.0	2.18	82			3.20	365	2.60	176
5.....			1.80	30.0	2.01	54			3.05	312	2.57	168
6.....			1.79	29.0	2.05	60			2.90	260	2.50	150
7.....			1.79	29.0	1.98	50			2.80	230	2.35	116
8.....			1.73	23.0	1.90a	40			3.19	362	2.29	104
9.....			1.75	25.0	1.83	33			3.20	365	1.95	46
10.....			1.75	25.0	1.87	37			3.42	442	2.01	54
11.....			1.73	23.0	2.11	70			3.30	400	2.00	52
12.....			1.67	17.8	2.08	65			3.16	351	1.97	48
13.....			1.69	19.2	2.81	233			2.91	264	1.95	46
14.....			1.69	19.2	b				2.83	239	1.97	48
15.....			1.66	17.0					3.18	358	2.00	52
16.....			1.64	15.5					3.03	305	2.00	52
17.....			1.64	15.5					3.20	365	2.37	120
18.....	2.40	126.0	1.62	14.0					3.20	365	2.65	189
19.....	2.20	86.0	1.59	11.8	c				3.11	333	2.50	150
20.....	2.13	73.0	1.60	12.5	3.09	326			3.10	330	2.43	133
21.....	2.03	57.0	1.42	3.2	b				3.10	330	2.30	106
22.....	1.88	38.0	1.57	10.6					2.92	267	b	
23.....	1.95	46.0	1.58	11.2					2.95	277		
24.....	1.87	37.0	1.58	11.2					2.91	263		
25.....	1.80	30.0	1.70	20.0					2.80	230		
26.....	1.80	30.0	1.66	17.0					2.89	257		
27.....	1.75	25.0	1.63	14.8					2.90	260		
28.....	1.65	16.2	1.59	11.8					2.85	245		
29.....	1.65	16.2	1.56	9.9					2.77	222		
30.....	1.65	16.2	1.54	8.6					2.75	216		
31.....	1.67	17.8							2.70	202	c	

a Gauge height interpolated.

b-c No gauge height observations made.

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Stimson Creek near Pekisko, for 1915.

(Drainage area 78 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (18-31).....	126	16.2	44.0	0.562	0.29	1,219
April.....	35	3.2	18.6	0.238	0.27	1,107
May (1-13, 20).....	326	8.0	95.0	1.223	0.64	2,649
June..... <sup>a</sup>						
July (2-31).....	442	202.0	308.0	3.949	4.41	18,327
August (1-21).....	216	46.0	116.0	1.487	1.16	4,832
The period.....					6.77	28,134

<sup>a</sup> Records for one day only available.

## FINDLAY AND MCDUGAL DITCH FROM HIGHWOOD RIVER.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 31, Tp. 18, Rge. 29, W. 4th Mer., about four and one-half miles west of the town of High River.

*Records available.*—June 17, 1911, to October 8, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 99.25 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Soft mud liable to shift.

*Discharge measurements.*—By wading.

*Winter flow.*—Ditch closed off at freeze-up.

*Artificial control.*—Discharge at station may be controlled by means of the headgates about one-quarter of a mile above station.

*Observer.*—No observations of daily gauge height during 1914-15.

## DISCHARGE MEASUREMENTS of Findlay and McDougal Ditch from Highwood River, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 23.....	H. B. R. Thompson.....					Nil.
Aug. 7.....	do.....	6.3	2.37	0.81	1.03	1.91
Sept. 8.....	do.....	7.0	3.85	0.60	1.20	2.30
Oct. 8.....	do.....	6.5	0.34	0.34	0.90	0.70

## LITTLE BOW DITCH FROM HIGHWOOD RIVER.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 6, Tp. 19, Rge. 28, W. 4th Mer., about 100 feet from the power station and pumping plant of the town of High River.

*Records available.*—August 1, 1910, to December 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 91.06 feet during 1910-11. Zero elevation maintained at 92.06 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Fairly permanent.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Continuous records kept during winter.

*Artificial control.*—Formed by headgates of ditch about twenty feet below station.

*Observer.*—Philip Weinard.

## DISCHARGE MEASUREMENTS of Little Bow Ditch from Highwood River, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 5.	R. J. McGuinness.	13.8	14.20	0.53	0.42	7.60
Jan. 22.	H. S. Kerby.	13.5	15.15	0.46	0.70	6.90
Feb. 17.	H. W. Rowley.	13.2	11.32	0.57	0.32	6.40
Mar. 4.	do	13.0	12.25	0.60	0.42	7.40
Mar. 26.	R. J. McGuinness.	12.8	10.20	0.56	0.27	5.60
April 20.	do	13.9	11.90	0.66	0.38	7.80
May 19.	do	12.5	20.90	1.62	1.33	34.00
June 23.	H. B. R. Thompson.	12.5	20.30	1.85	1.40	38.00
Aug. 7.	do	13.3	11.52	1.66	0.70	19.10
Sept. 9.	do	17.1	10.26	0.65	0.25	6.70
Oct. 8.	do	17.0	9.86	0.55	0.20	5.50
Nov. 10.	F. K. Beach.	9.1	0.93	0.17	0.04	0.16
Nov. 10.	do				0.16	Nil. <sup>a</sup>
Dec. 16.	do				Dry.	Nil.

<sup>a</sup> Water standing in pools.

## DAILY GAUGE HEIGHT AND DISCHARGE of Little Bow Ditch from Highwood River, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	0.34	6.3	0.64	12.5	0.27	5.0	0.28	5.2	0.53	10	1.13	27
2.	0.32	5.9	0.47	8.9	0.34	6.3	0.27	5.0	0.86	19	1.67	48
3.	0.31	5.7	0.45	8.5	0.31	5.7	0.29	5.4	0.76	16	1.76	52
4.	0.31	5.7	0.42	7.9	0.35	6.5	0.31	5.7	0.62	12	1.55	43
5.	0.55	10.5	0.39	7.3	0.28	5.2	0.29	5.4	0.62	12	1.77	52
6.	0.33	6.1	0.35	6.5	0.33	6.1	0.27	5.0	0.75	16	1.68	48
7.	0.34	6.3	0.35	6.5	0.29	5.4	0.29	5.4	0.71	14	1.57	44
8.	0.34	6.3	0.35	6.5	0.36	6.7	0.27	5.0	1.26	31	1.67	48
9.	0.35	6.5	0.31	5.7	0.38	7.1	0.27	5.0	1.56	43	1.58	44
10.	0.34	6.3	0.34	6.3	0.26	4.9	0.28	5.2	1.47	40	1.23	30
11.	0.35	6.5	0.39	7.3	0.33	6.1	0.27	5.0	1.21	29	1.20	29
12.	0.34	6.3	0.35	6.5	0.34	6.3	0.28	5.2	0.92	21	1.43	38
13.	0.34	6.3	0.30	5.5	0.29	5.4	0.27	5.0	0.85	18	1.39	37
14.	0.50	9.5	0.44	8.3	0.28	5.2	0.29	5.4	1.76	52	1.68	48
15.	0.39	7.3	0.33	6.1	0.34	6.3	0.30	5.5	1.61	45	1.72	50
16.	0.41	7.7	0.30	5.5	0.42	7.9	0.30	5.5	1.73	50	1.83	55
17.	0.30	5.5	0.32	5.9	0.48	9.1	0.30	5.5	1.68	48	1.88	58
18.	0.30	5.5	0.35	6.5	0.44	8.3	0.32	5.9	1.54	43	2.31	80
19.	0.30	5.5	0.34	6.3	0.43	8.1	0.35	6.5	1.43	38	2.94	116
20.	0.33	6.1	0.34	6.3	0.41	7.7	0.36	6.7	0.97	22	2.58	95
21.	0.54	10.3	0.33	6.1	0.41	7.7	0.36	6.7	1.17	28	2.31	80
22.	0.45	8.5	0.35	6.5	0.38	7.1	0.37	6.9	0.88	19	2.13	70
23.	0.35	6.5	0.31	5.7	0.34	6.3	0.37	6.9	1.17	28	2.12	70
24.	0.40	7.5	0.33	6.1	0.32	5.9	0.37	6.9	1.49	41	2.13	70
25.	0.39	7.3	0.34	6.3	0.37	6.9	0.35	6.5	1.77	52	2.35	82
26.	0.45	8.5	0.33	6.1	0.37	6.9	0.35	6.5	1.86	57	5.95	324
27.	0.50	9.5	0.34	6.3	0.29	5.4	0.36	6.7	1.74	51	3.42	147
28.	0.46	8.7	0.34	6.3	0.27	5.0	0.35	6.5	1.73	50	1.80	54
29.	0.60	11.5			0.23	4.4	0.35	6.5	1.77	52	1.45	39
30.	0.67	13.2			0.24	4.6	0.39	7.3	1.58	44	1.22	30
31.	0.64	12.5			0.24	4.6			1.28	32		



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Little Bow Ditch from Highwood River, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.22	30.00	1.62	46.00	0.15	3.20	0.17	3.60	0.03	1.45	Dry.	Nil.
2.....	0.75	15.50	1.45	39.00	0.23	4.40	0.32	5.90	0.21	4.20	1.76	52.00
3.....	0.60	11.50	1.43	38.00	0.25	4.80	0.32	5.90	0.05	1.75	0.33	6.10
4.....	0.60	11.50	1.00	23.00	0.25	4.80	0.29	5.40	0.04	1.60	Dry.	Nil.
5.....	0.30	5.50	0.69	13.80	0.00	1.00	0.22	4.30	0.01	1.15		
6.....	0.20	4.00	0.55	10.50	0.20	4.00	0.26	4.90	0.00	1.00	*	*
7.....	0.20	4.00	0.45	8.50	0.15	3.20	0.24	4.60	Dry.	Nil.	0.00	1.00
8.....	0.05	1.75	0.65	12.80	0.20	4.00	0.22	4.30	0.01	1.15	0.01	1.15
9.....	Dry.	Nil.	0.25	4.80	0.25	4.80	0.10	2.50	0.14	3.10	0.06	1.90
10.....	*	0.20	4.00	0.12	2.80	0.12	2.80	Dry.	Nil.	0.00	1.00	
11.....	"	"	0.12	2.80	0.07	2.00	0.12	2.80	"	"	0.66	13.00
12.....	"	"	0.07	2.00	0.07	2.00	0.10	2.50	0.30	5.50	0.66	13.00
13.....	0.67	13.20	0.18	3.70	0.06	1.90	0.09	2.40	0.01	1.15	-0.04	0.50
14.....	0.18	3.70	0.05	1.75	0.02	1.30	0.09	2.40	Dry.	Nil.	-0.09	0.25
15.....	0.18	3.70	0.05	1.75	0.02	1.30	0.12	2.80	"	"	-0.14	0.10
16.....	0.28	5.20	0.03	1.45	0.02	1.30	0.10	2.50	"	"	Dry.	Nil.
17.....	1.43	3.80	0.10	2.50	0.00	1.00	0.08	2.20	"	"	"	"
18.....	1.66	47.00	0.05	1.75	0.02	1.30	0.08	2.20	"	"	"	"
19.....	1.47	40.00	0.30	5.50	0.06	1.90	0.10	2.50	"	"	"	"
20.....	1.45	39.00	0.55	10.50	0.06	1.90	0.12	2.80	"	"	"	"
21.....	1.17	28.00	0.30	5.50	0.02	1.30	0.11	2.60	"	"	"	"
22.....	1.07	25.00	0.10	2.50	0.02	1.30	0.08	2.20	0.81	17.30	"	"
23.....	0.96	22.00	0.05	1.75	0.10	2.50	0.11	2.60	1.56	43.00	"	"
24.....	0.86	18.80	0.05	1.75	0.62	12.00	0.08	2.20	1.56	43.00	"	"
25.....	1.44	39.00	0.52	9.90	0.62	12.00	0.04	1.60	1.34	34.00	"	"
26.....	1.44	39.00	0.50	9.50	0.00	1.00	0.03	1.45	1.14	27.00	"	"
27.....	1.82	55.00	0.40	7.50	0.32	5.90	0.06	1.90	1.01	23.00	"	"
28.....	1.86	57.00	0.40	7.50	0.29	5.40	0.05	1.80	0.00	1.00	"	"
29.....	1.81	54.00	0.00	1.00	0.15	3.20	0.02	1.30	0.00	1.00	"	"
30.....	1.53	42.00	0.00	1.00	0.15	3.20	0.02	1.30	0.96	22.00	"	"
31.....	1.37	36.00	0.22	4.30		Dry.	Nil.				"	"

## MONTHLY DISCHARGE of Little Bow Ditch from Highwood River, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet
	Maximum.	Minimum.	Mean.	
January	13.2	5.50	7.6	467
February	12.5	5.50	6.8	378
March	9.1	4.40	6.3	387
April	7.3	5.00	5.9	351
May	57.0	10.00	33.0	2,029
June	324.0	27.00	67.0	3,987
July	57.0	0.00	21.0	1,291
August	46.0	1.00	9.2	566
September	12.0	1.00	3.4	202
October	5.9	0.00	2.8	173
November	43.0	0.00	7.8	464
December	52.0	0.00	2.9	178
The year				10,472

## HIGHWOOD RIVER AT HIGH RIVER.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 6, Tp. 19, Rge. 2S, W. 4th Mer., at the new steel traffic bridge in the town of High River.

*Records available.*—May 28, 1908, to December 31, 1915.

*Gauge.*—Chain gauge. Elevation of zero of gauge was 3,381.66 during 1908-13. Elevation of zero of gauge was 3,379.74 during 1914-15.

*Bench-mark.*—Permanent iron bench-mark, 128 feet N. 60° E. from S.E. corner of stream face of right abutment. Elevation, 3,389.60. (Canadian Pacific Railway Company's datum.)

*Channel.*—Fairly permanent.

*Discharge measurements.*—From bridge.

*Winter flow.*—Observations taken the whole year.

*Floods.*—The highest recorded flow in recent years occurred June 26, 1915, when the stream at this point had an estimated discharge of 8,335 sec.-ft. In addition to the discharge at the station there was a discharge of some 4,000 sec.-ft. through Lineham spillway.

*Diversions.*—The Little Bow Ditch diverts water about two miles above the station.

*Observer.*—Philip Weinard.

### DISCHARGE MEASUREMENTS of Highwood River at High River, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 5.....	R. J. McGuinness.....	75.0	156.0	0.63	3.62	98.0
Jan. 22.....	H. S. Kerby.....	75.0	134.0	0.58	3.52	78.0
Feb. 17.....	H. W. Rowley.....	75.0	141.5	0.54	3.59	75.0
Mar. 4.....	do.....	73.0	138.0	0.54	3.59	75.0
Mar. 26.....	R. J. McGuinness.....	113.0	207.0	0.40	3.75	84.0
April 20.....	do.....	136.0	309.9	1.58	4.51	490.0
May 19.....	do.....	158.0	580.3	3.75	5.89	2,177.0
June 23.....	H. B. R. Thompson.....	160.0	607.0	4.58	6.23	2,781.0
June 26.....	do.....	172.5	1,188.0	7.02	9.35	8,335.0
June 29.....	do.....	172.5	980.0	4.04	7.13	3,960.0
July 1.....	do.....	172.0	963.0	3.90	7.10	3,757.0
Aug. 7.....	do.....	154.0	610.5	1.61	5.23	983.0
Sept. 8.....	do.....	160.0	484.4	0.84	4.45	405.0
Oct. 8.....	do.....	160.0	483.1	0.83	4.445	401.0
Nov. 10.....	F. K. Beach.....	149.0	435.5	0.46	4.035	200.0
Dec. 16.....	do.....	119.0	312.0	0.44	3.70	139.0

### DAILY GAUGE HEIGHT AND DISCHARGE of Highwood River at High River, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.67	94	3.64	75	3.63	76	3.58	61	4.94	900	5.70	1,890
2.....	3.68	95	3.50	69	3.54	76	3.71	92	5.43	1,485	5.84	2,104
3.....	3.67	96	3.54	70	3.54	76	3.95	168	5.47	1,545	5.91	2,216
4.....	3.66	97	3.59	71	3.57	76	3.95	168	5.24	1,248	5.73	1,935
5.....	3.62	98	3.59	71	3.54	76	3.97	174	5.29	1,308	5.91	2,216
6.....	3.42	93	3.53	72	3.59	76	3.88	143	5.26	1,272	5.83	2,088
7.....	3.47	94	3.56	73	3.59	76	3.83	126	5.43	1,435	5.83	2,088
8.....	3.53	94	3.60	73	3.49	76	3.91	154	5.77	1,995	5.91	2,216
9.....	3.62	93	3.55	74	3.49	76	3.81	118	5.91	2,216	5.79	2,025
10.....	3.62	92	3.60	74	3.49	75	3.72	95	5.79	2,025	5.71	1,905
11.....	3.61	92	3.48	74	3.56	74	3.67	83	5.68	1,860	5.64	1,800
12.....	3.60	92	3.40	74	3.48	74	3.82	122	5.47	1,545	5.70	1,890
13.....	3.60	92	3.47	75	3.48	75	3.91	154	5.52	1,620	5.77	1,995
14.....	3.61	90	3.45	76	3.53	74	4.01	185	6.62	3,416	5.89	2,184
15.....	3.29	83	3.51	76	3.58	73	4.05	205	6.30	2,840	5.99	2,344
16.....	3.52	84	3.48	76	3.65	73	4.07	215	6.01	2,376	6.07	2,472
17.....	3.57	85	3.54	76	3.70	73	4.12	240	5.88	2,168	6.09	2,504
18.....	3.52	85	3.49	76	3.65	74	4.41	418	5.96	2,296	6.50	3,200
19.....	3.54	83	3.58	75	3.60	76	4.40	410	5.82	2,072	6.91	3,938
20.....	3.51	82	3.60	74	3.65	78	4.50	490	5.64	1,800	6.68	3,524
21.....	3.51	79	3.54	72	3.71	79	4.45	450	5.67	1,845	6.33	2,894
22.....	3.40	78	3.54	72	3.69	80	4.45	450	5.60	1,740	6.16	2,616
23.....	3.49	77	3.44	72	3.74	82	4.45	450	5.73	1,935	6.12	2,552
24.....	3.43	76	3.54	73	3.78	110	4.34	368	5.90	2,200	6.14	2,584
25.....	3.50	73	3.48	74	3.54	52	4.31	347	5.99	2,344	6.25	2,760
26.....	3.54	71	3.51	75	3.85	132	4.31	347	6.10	2,520	9.18	8,024
27.....	3.54	70	3.57	75	3.35	30	4.35	375	6.00	2,360	8.32	6,476
28.....	3.59	70	3.57	75	3.35	30	4.30	340	5.94	2,264	7.46	4,928
29.....	3.56	73	.....	.....	3.52	49	4.30	340	5.99	2,344	7.06	3,760
30.....	3.61	75	.....	.....	3.48	43	4.35	375	5.83	2,088	6.80	3,240
31.....	3.64	75	.....	.....	3.60	66	.....	.....	5.71	1,905	.....	.....

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood River at High River, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	7.08	3,800	5.82	1,648	4.35	325	4.48	398	4.30	300	3.75	148
2.	6.62	2,916	5.80	1,620	4.37	335	4.50	410	4.28	290	3.85	150
3.	6.60	2,880	5.60	1,380	4.35	325	4.50	410	4.19	246	3.90	152
4.	6.32	2,392	5.50	1,260	4.25	275	4.52	422	4.23	265	4.00	154
5.	6.20	2,200	5.45	1,200	4.30	300	4.49	404	4.15	230	3.98	151
6.	6.11	2,056	5.25	990	4.35	325	4.47	392	4.10	210	4.00	146
7.	6.36	2,456	5.23	970	4.43	368	4.47	392	3.90	140	3.95	140
8.	6.32	2,392	5.10	850	4.52	422	4.47	392	3.89	138	4.00	139
9.	6.10	2,040	5.00	760	4.50	410	4.47	392	4.09	206	4.25	143
10.	5.95	1,830	5.00	760	4.60	470	4.51	416	4.03	182	3.85	137
11.	5.85	1,690	4.95	720	4.52	422	3.59	464	4.10	210	3.80	136
12.	5.78	1,596	4.90	680	4.47	392	4.45	380	3.75	102	3.80	136
13.	5.70	1,500	5.00	760	4.37	335	4.48	398	3.75	102	3.90	138
14.	6.30	2,360	4.95	720	4.37	335	4.59	464	3.95	155	3.80	138
15.	5.98	1,872	4.95	720	4.34	320	4.38	340	3.90	142	3.78	139
16.	5.88	1,732	4.90	680	4.30	300	4.37	335	4.13	200	3.70	139
17.	6.21	2,216	4.87	659	4.25	275	4.32	310	4.04	186	3.75	140
18.	6.20	2,200	4.90	680	4.25	275	4.31	305	4.08	180	3.70	141
19.	6.00	1,900	5.28	1,020	4.27	285	4.33	315	4.03	174	3.53	143
20.	5.80	1,620	5.47	1,224	4.30	300	4.33	315	4.05	136	3.40	146
21.	5.62	1,404	5.07	823	4.27	285	4.35	325	3.85	138	3.60	152
22.	5.52	1,284	4.90	680	4.25	275	4.35	325	3.90	140	4.50	158
23.	5.50	1,260	4.82	624	4.20	250	4.35	325	4.00	150	4.00	148
24.	5.52	1,284	4.70	540	4.60	470	4.36	330	4.15	163	3.67	142
25.	5.92	1,788	4.60	470	4.55	440	4.32	310	4.00	136	3.57	129
26.	5.80	1,620	4.58	458	4.55	440	4.21	255	4.00	135	3.63	126
27.	6.00	1,900	4.45	380	4.50	410	4.31	305	3.98	132	3.74	128
28.	5.85	1,690	4.40	350	4.47	392	4.31	305	3.85	128	3.85	131
29.	6.00	1,900	4.37	335	4.47	392	4.33	315	3.60	124	3.85	133
30.	5.85	1,690	4.42	362	4.45	380	4.32	310	3.65	147	3.70	134
31.	5.85	1,690	4.40	350			4.32	310			3.74	131

## MONTHLY DISCHARGE of Highwood River at High River, for 1915.

(Drainage area 746 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	98	70	85	0.114	0.13	5,226
February	76	69	74	0.099	0.10	4,110
March	132	30	66	0.088	0.10	4,058
April	490	61	255	0.342	0.38	15,174
May	3,416	900	1,968	2.638	3.04	121,008
June	8,024	1,800	2,879	3.859	4.31	171,311
July	3,800	1,260	1,973	2.645	3.05	121,314
August	1,648	335	796	1.067	1.23	48,949
September	470	250	351	0.470	0.52	20,886
October	464	255	357	0.479	0.55	21,951
November	300	102	173	0.232	0.26	10,294
December	158	126	141	0.189	0.22	8,670
The year.					13.89	552,951

## HIGHWOOD RIVER NEAR ALDERSYDE.

*Location.*—On NW ¼ Sec. 17, Tp. 20, Rge. 28, W. 4th Mer., at L. W. Barret's ranch about three miles northeast of Aldersyde.

*Records available.*—From October 3, 1911, to October 31, 1915.

*Gauge.*—Standard chain gauge. The elevation of zero has been maintained at 90.64 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Probably permanent. Large stones and boulders in and near section.

*Discharge measurements.*—From traffic bridge or by wading.

*Winter flow.*—No observations taken during winter months.

*Flood.*—The highest recorded discharge took place June 26, 1915, when the water level at this point was 98.34 feet with an estimated flow of 13,980 sec.-ft. (See Highwood River at High River.)

*Observer.*—D. W. Barret.

### DISCHARGE MEASUREMENTS of Highwood River near Aldersyde, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 15.....	R. J. McGuinness.....	131.0	187	1.68	1.31	314
May 11.....	do.....	211.0	487	4.25	2.88	2,070
June 18.....	H. B. R. Thompson.....	220.0	708	5.40	3.60	3,822
June 26.....	do.....	238.0	1,626	8.59	7.70	13,980 <sup>a</sup>
Aug. 3.....	do.....	189.0	399	3.95	2.62	2,625
Sept. 2.....	do.....	147.0	226	1.75	1.60	396
Sept. 30.....	do.....	152.0	238	2.13	1.71	507
Nov. 5.....	F. K. Beach.....	139.5	218	1.62	1.53	353

<sup>a</sup> Slope estimate.

### DAILY GAUGE HEIGHT AND DISCHARGE of Highwood River, near Aldersyde, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.65	62	1.96	736	2.91	2,036
2.....			2.62	93	2.31	1,154	3.05	2,270
3.....			2.52	168	2.63	1,602	3.18	2,504
4.....			2.51	180	2.43	1,322	3.00	2,180
5.....			1.42	244	2.45	1,350	3.16	2,468
6.....			1.40	230	2.47	1,378	3.19	2,522
7.....			1.39	223	2.45	1,350	3.14	2,432
8.....			1.37	209	2.73	1,748	3.10	2,360
9.....			1.34	188	3.02	2,216	3.01	2,198
10.....			1.21	106	2.93	2,068	2.96	2,116
11.....			1.12	52	2.96	2,116	2.88	1,988
12.....			1.11	46	2.69	1,686	2.86	1,956
13.....			1.18	88	2.57	1,518	2.98	2,148
14.....			1.41	237	3.84	3,700	3.00	2,180
15.....			1.34	188	3.67	3,386	3.25	2,630
16.....			1.37	209	3.37	2,846	3.41	2,918
17.....	3.72	73	1.39	223	3.15	2,450	3.26	2,648
18.....	3.70	75	1.54	332	3.12	2,396	3.56	3,188
19.....	3.69	78	1.61	389	3.20	2,540	4.06	4,140
20.....	3.61	77	1.70	470	2.98	2,148	4.25	4,525
21.....		80	1.72	490	2.92	2,052	3.67	3,386
22.....	2.97	75	1.67	443	2.89	2,004	3.64	3,332
23.....	2.85	72	1.56	348	2.92	2,052	3.36	2,828
24.....	2.87	96	1.54	332	3.00	2,180	3.28	2,684
25.....	2.67	100	1.56	348	3.22	2,576	3.30	2,720
26.....	2.77	135	1.53	324	3.24	2,612	6.94	11,640
27.....	2.56	60	1.57	356	3.23	2,594	6.59	10,590
28.....	2.62	64	1.59	372	3.17	2,486	4.83	5,812
29.....	2.66	50	1.56	348	3.11	2,378	3.40	2,900
30.....	2.63	45	1.62	398	3.09	2,342	4.07	4,160
31.....	2.77	65			2.94	2,084		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood River, near Aldersyde, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4.09	4,200	2.90 <sup>d</sup>	2,020	1.55	340	1.73	500
2	4.01	4,040	3.06	2,288	1.60	380	1.71	480
3	3.70	3,440	2.62	1,588	1.59	372	1.74	510
4	3.39	2,882	2.56	1,504	1.57	356	1.75	520
5	3.37	2,846	2.54	1,476	1.55	340	1.73	500
6	3.27	2,666	2.41	1,294	1.53	324	1.72	490
7	3.32	2,756	2.28	1,114	1.56	348	1.70	470
8	3.40	2,900	2.16	962	1.88	650	1.69	461
9	3.33	2,774	2.14	938	1.76	530	1.68	452
10	3.03	2,234	2.12	814	1.92	692	1.68	452
11	2.74	1,764	2.09	870	1.89	660	1.68	452
12	2.72	1,732	2.04	824	1.70	470	1.67	443
13	2.59	1,546	2.02	802	1.67	443	1.66	434
14	3.18	2,504	2.11	902	1.59	372	1.66	434
15	3.37	2,846	2.16	962	1.57	356	1.66	434
16	3.12	2,396	2.08 <sup>d</sup>	868	1.56	348	1.64	416
17	3.33	2,774	2.01	791	1.55	340	1.66	407
18	3.51	3,098	2.01	791	1.55	340	1.62	398
19	3.14	2,432	2.16	962	1.54	332	1.62	398
20	2.78	1,828	2.35	1,210	1.59	372	1.61	389
21	2.73	1,748	2.54	1,476	1.61	389	1.60	380
22	2.59	1,546	2.19	998	1.60	380	1.62	398
23	2.53	1,462	2.04	824	1.72 <sup>d</sup>	490	1.64	416
24	2.58	1,532	1.98	758	1.83	600	1.60	380
25	3.25	2,630	1.97	747	1.97	747	1.56	348
26	2.84	1,924	1.94	714	1.92	692	1.54	332
27	2.68	1,672	1.86	630	1.87	640	1.52	316
28	2.74	1,764	1.72	490	1.78	550	1.53	324
29	3.22	2,576	1.70	470	1.76	530	1.55	340
30	3.07	2,306	1.68	452	1.71	480	1.66	434
31	2.74	1,764	1.56	348			1.61	359

<sup>d</sup> Gauge height interpolated.

## MONTHLY DISCHARGE of Highwood River near Aldersyde, for 1915.

(Drainage area 883 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean	Per square Mile.	Depth in inches on Drainage Area.	Total in Acres-feet.
March (17-31)	135	45	76	0.086	0.05	2,281
April	490	46	257	0.291	0.32	11,794
May	3,700	736	2,099	2.377	2.74	128,959
June	11,610	1,956	3,382	3.830	4.27	291,240
July	4,200	1,462	2,406	2.725	3.14	147,940
August	2,288	348	1,000	1.133	1.31	61,488
September	747	324	462	0.523	0.58	25,491
October	520	316	422	0.478	0.55	25,948
The period					12.96	616,740

## BOW RIVER NEAR NAMAKA

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 32, Tp. 21, Rge. 25, W. 4th Mer., about one-half mile below the dam of the Southern Alberta Land Company.*Records available.*—From September, 1909, to October, 1910, from May 13, 1913, to August 22, 1914, and from April 13, 1915, to October 23, 1915.*Gauge.*—Vertical staff. Elevation of zero maintained at 2,955.13 feet from August 27, 1915, to the end of the year.

*Bench-mark.*—Permanent iron bench-mark on right bank about 25 feet NE. of cable tower.  
Elevation, 2,962.92 feet. (Canadian Pacific Railway datum.)

*Channel.*—Permanent.

*Discharge measurements.*—Made from cable.

*Observer.*—A. P. Moorhouse.

# DISCHARGE MEASUREMENTS of Bow River near Namaka, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 13.....	R. J. McGuinness.....	322	1,050	1.76	0.53	1,848
May 4.....	do.....	248	1,602	3.11	2.20	4,984
June 4.....	do.....	366	2,342	5.12	4.09	11,991
July 13.....	H. B. R. Thompson.....	377	2,120	5.76	4.27	12,223
Aug. 20.....	do.....	377	1,964	5.64	4.09	11,085
Sept. 17.....	do.....	356	1,491	3.01	1.70	4,491
Oct. 13.....	do.....	357	1,425	2.86	1.52	4,074

# DAILY GAUGE HEIGHT AND DISCHARGE of Bow River near Namaka, for 1915.

DAY.	September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	.....	1.76	4,544
2.....	2.45	5,940	1.76	4,544
3.....	2.40	5,830	1.80	4,620
4.....	2.10	5,210	1.75	4,525
5.....	2.10	5,210	1.66	4,358
6.....	2.10	5,210	1.66	4,358
7.....	2.35	5,725	1.66	4,358
8.....	2.60	6,270	1.60	4,250
9.....	2.65	6,385	1.58	4,214
10.....	2.50	6,050	1.56	4,178
11.....	2.35	5,725	1.54	4,142
12.....	2.20	5,410	1.50	4,070
13.....	2.05	5,110	1.52	4,106
14.....	1.90	4,810	1.40	3,900
15.....	1.90	4,810	1.38	3,866
16.....	1.80	4,620	1.36	3,832
17.....	1.70	4,430	1.35	3,815
18.....	1.68	4,394	1.35	3,815
19.....	1.70	4,430	1.34	3,798
20.....	1.90	4,810	1.34	3,798
21.....	1.88	4,772	1.33	3,781
22.....	1.70	4,430	1.32	3,764
23.....	1.75	4,525	1.30	3,730
24.....	2.26	5,536	.....	.....
25.....	2.25	5,515	.....	.....
26.....	2.10	5,210	.....	.....
27.....	1.95	4,910	.....	.....
28.....	1.85	4,715	.....	.....
29.....	1.80	4,620	.....	.....
30.....	1.80	4,620	.....	.....
31.....	.....	.....	.....	.....

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Bow River near Namaka, for 1915.

(Drainage area 6,208 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
September.....	6,385	4,394	5,146	0.829	0.89	296,001
October (1-23).....	4,620	3,730	4,103	0.661	0.56	187,134
The period.....					1.45	483,135

## NORTH BRANCH OF CANADIAN PACIFIC RAILWAY COMPANY CANAL NEAR BASSANO.

*Location.*—On NW.  $\frac{1}{4}$  Sec. 3, Tp. 21, Rge. 18, W. 4th Mer., about three miles southeast of the town of Bassano, and about three and one-half miles east of the Bassano dam.

*Records available.*—From May 1, 1914, to November 8, 1915.

*Gauge.*—Vertical staff in stilling box. Zero of gauge is at elevation of floor of rating flume at measuring section, 90.54 feet.

*Bench-mark.*—Top of left abutment of gauging bridge. Assumed elevation, 100.00 feet.

*Channel.*—Permanent concrete channel.

*Discharge measurements.*—From gauging bridge or by wading underneath.

*Winter flow.*—Ditch closed off at freeze-up.

*Artificial control.*—Discharge at station may be controlled by means of the headgates about 400 feet above the station.

*Co-operation.*—Gauge heights supplied by Canadian Pacific Railway Company.

*Observer.*—The Superintendent of Maintenance and Operation, Canadian Pacific Railway Department of Natural Resources, Brooks, Alta.

## DISCHARGE MEASUREMENTS of North Branch of Canadian Pacific Railway Company Canal near Bassano, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 8.....	R. J. McGuinness.....	32.0	35.8	1.26	1.14	45.0
May 28.....	do.....	33.0	31.6	1.29	1.03	41.0
May 28.....	do.....	39.8	93.6	2.68	2.74	250.0
May 28.....	do.....	37.0	62.9	1.66	1.91	104.0
May 29.....	do.....	31.8	21.3	0.85	0.70	18.1
July 15.....	H. B. R. Thompson.....	33.0	29.0	1.05	1.00	31.0
Aug. 21.....	do.....	34.5	44.1	1.47	1.40	65.0
Sept. 20.....	do.....	34.0	38.5	1.33	1.23	51.0
Oct. 14.....	do.....	32.0	23.1	0.96	0.77	22.0
Nov. 25.....	F. K. Beach.....					Nil.
Dec. 20.....	do.....					Nil.

a Water turned off.



DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Canadian Pacific Railway Company Canal, near Bassano, for 1915.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	1.30	54	1.30	54	1.00	34	1.00	34
2	1.30	54	1.30	54	1.00	34	1.00	34
3	1.30	54	1.30	54	1.00	34	1.00	34
4	1.30	54	1.30	54	1.00	34	1.00	34
5	1.30	54	1.30	54	0.50	12	1.00	34
6	1.30	54	1.30	54	0.50	12	1.00	34
7	1.30	54	1.30	54	0.50	12	1.00	34
8	1.30	54	1.30	54	0.80	23	1.00	34
9	1.30	54	1.30	54	0.80	23	1.00	34
10	1.30	54	1.30	54	0.80	23	1.00	34
11	1.30	54	1.30	54	0.80	23	1.00	34
12	1.50	68	1.50	68	0.80	23	1.00	34
13	1.50	68	1.50	68	0.80	23	1.00	34
14	1.50	68	1.50	68	0.80	23	1.00	34
15	1.50	68	1.50	68	1.00	34	1.00	34
16	1.00	34	1.00	34	1.00	34	1.00	34
17	0.80	23	0.80	23	1.00	34	1.00	34
18	0.80	23	0.80	23	1.00	34	1.05	37
19	0.80	23	0.80	23	1.00	34	1.05	37
20	1.30	54	0.80	23	1.00	34	1.05	37
21	1.30	54	0.80	23	1.00	34	1.05	37
22	1.30	54	0.80	23	1.00	34	1.05	37
23	1.30	54	0.80	23	1.00	34	1.05	37
24	1.30	54	0.80	23	1.00	34	1.05	37
25	1.30	54	0.80	23	1.00	34	1.05	37
26	1.30	54	0.80	23	1.00	34	1.05	37
27	1.30	54	0.80	23	1.00	34	1.05	37
28	1.30	54	0.80	23	1.00	34	1.20	47
29	1.30	54	0.80	23	1.00	34	1.20	47
30	1.30	54	0.80	23	1.00	34	1.20	47
31	1.30	54	0.80	23	1.00	34	1.20	47

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Canadian Pacific Railway Company Canal near Bassano, for 1915.—*Concluded.*

DAY.	August.		September.		October.		November.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.20	47	1.20	47	1.20	47	1.00	34
2.....	1.20	47	1.00	34	0.80	23	1.00	34
3.....	1.20	47	1.00	34	1.10	40	1.00	34
4.....	1.10	40	1.00	34	1.10	40	0.60	15
5.....	1.10	40	1.20	47	1.10	40	0.60	15
6.....	1.10	40	1.20	47	1.10	40	0.60	15
7.....	1.10	40	1.20	47	1.10	40	0.60	15
8.....	1.10	40	1.20	47	1.10	40	0.60a	15
9.....	1.10	40	1.20	47	0.60	15		
10.....	1.20	47	1.20	47	0.70	18		
11.....	1.20	47	1.20	47	0.70	18		
12.....	1.20	47	1.20	47	0.70	18		
13.....	1.20	47	1.20	47	0.70	18		
14.....	1.20	47	1.20	47	0.70	18		
15.....	1.20	47	1.20	47	0.70	18		
16.....	1.20	47	1.20	47	0.70	18		
17.....	1.20	47	1.20	47	0.70	18		
18.....	1.20	47	1.20	47	0.70	18		
19.....	1.20	47	1.20	47	0.70	18		
20.....	1.20	47	1.20	47	0.70	18		
21.....	1.20	47	1.20	47	0.70	18		
22.....	1.20	47	1.20	47	0.70	18		
23.....	1.20	47	1.20	47	0.70	18		
24.....	1.20	47	1.20	47	0.70	18		
25.....	1.20	47	1.20	47	0.70	18		
26.....	1.20	47	1.20	47	0.70	18		
27.....	1.20	47	1.20	47	0.70	18		
28.....	1.20	47	1.20	47	1.00	34		
29.....	1.20	47	1.20	47	1.00	34		
30.....	1.20	47	1.20	47	1.00	34		
31.....	1.20	47			1.00	34		

a Water turned off.

MONTHLY DISCHARGE of North Branch of Canadian Pacific Railway Company Canal near Bassano, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (20-30).....	54	54	54	1,178
May.....	68	23	40	2,460
June.....	34	12	29	1,726
July.....	47	34	37	2,375
August.....	47	40	46	2,328
September.....	47	34	46	2,737
October.....	47	15	25	1,337
November (1-8).....	34	15	22	349
The period.....				15,090

EAST BRANCH OF CANADIAN PACIFIC RAILWAY COMPANY CANAL NEAR BASSANO.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 3, Tp. 21, Rge. 18, W. 4th Mer., about 400 feet from headgates of East Branch and about three and one-half miles east of the Bassano dam.

*Records available.*—May 28, 1914, to December 31, 1915.

*Gauge.*—Vertical staff in stilling box. Zero of gauge is at elevation, of floor of rating flume at measuring section 87.67 feet.

*Bench-mark.*—Top of left abutment of gauging bridge. Assumed elevation, 100.00 feet.

*Channel.*—Permanent concrete channel.

*Discharge measurements.*—From gauging bridge or by wading underneath.

*Winter flow.*—Water is being run in this ditch during the winter of 1915-16 in order to fill reservoir Lake Newell.

*Artificial control.*—Discharge may be controlled by means of the headgates about 250 feet above station.

*Co-operation.*—Gauge heights supplied by the Canadian Pacific Railway Company.

*Observer.*—Superintendent of Maintenance and Operation, Canadian Pacific Railway Department of Natural Resources, Brooks, Alta.

DISCHARGE MEASUREMENTS of East Branch of Canadian Pacific Railway Company Canal near Bassano, for 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 8.....	R. J. McGuinness.....	71.0	71.0	1.31	1.11	94
May 28.....	do.....	72.2	90.5	1.19	1.34	108
May 29.....	do.....	72.2	87.7	1.19	1.30	104
July 15.....	H. B. R. Thompson.....	72.0	71.5	1.25	1.05	89
Aug. 21.....	do.....	74.0	106.5	1.24	1.50	132
Sept. 20.....	do.....	84.0	284.0	1.77	3.95	520
Oct. 13.....	do.....	84.5	303.8	1.94	4.09	591
Nov. 25.....	F. K. Beach.....	79.1	208.9	1.51	2.90	316
Dec. 20.....	do.....	77.0	224.8	1.18	3.09	264

DAILY GAUGE HEIGHT AND DISCHARGE of East Branch of Canadian Pacific Railway Company Canal near Bassano, for 1915.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.60	137	1.20	96	1.20	96
2.....			1.60	137	1.20	96	1.20	96
3.....			1.60	137	1.20	96	1.20	96
4.....			1.20	96	1.20	96	1.20	96
5.....			1.20	96	1.20	96	1.20	96
6.....			1.20	96	1.20	96	1.20	96
7.....			1.20	96	1.20	96	1.20	96
8.....			1.20	96	1.20	96	1.70	148
9.....			1.20	96	1.20	96	1.70	148
10.....			1.20	96	1.20	96	1.70	148
11.....			1.20	96	1.20	96	1.70	148
12.....			2.00	186	1.20	96	1.70	148
13.....			1.60	137	1.20	96	1.70	148
14.....			1.60	137	1.20	96	1.00	78
15.....			1.60	137	1.20	96	1.00	78
16.....			1.20	96	1.20	96	1.20	96
17.....			1.20	96	1.20	96	1.20	96
18.....	1.00	78	1.20	96	1.20	96	1.20	96
19.....	1.50	126	1.20	96	1.20	96	1.20	96
20.....	2.00	186	1.20	96	1.20	96	1.30	106
21.....	2.40	244	1.20	96	1.20	96	1.30	106
22.....	2.40	244	1.20	96	1.20	96	1.30	106
23.....	1.00	78	1.20	96	1.20	96	1.50	126
24.....	2.50	260	1.20	96	1.20	96	1.50	126
25.....	2.50	260	1.20	96	1.20	96	1.50	126
26.....	2.50	260	1.20	96	1.20	96	1.40	116
27.....	2.00	186	1.20	96	1.20	96	1.40	116
28.....	1.20	96	1.20	96	1.20	96	1.50	126
29.....	2.50	260	1.20	96	1.20	96	1.50	126
30.....	1.60	137	1.20	96	1.20	96	1.50	126
31.....			1.20	96			1.50	126

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DAILY GAUGE HEIGHT AND DISCHARGE of East Branch of Canadian Pacific Railway Company Canal near Bassano, for 1915.—*Concluded.*

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.50	126	2.80	309	3.95	540	3.50	440	2.50	245
2.....	1.50	126	3.50	440	3.00	344	3.50	440	1.90	172
3.....	1.40	116	3.50	440	3.55	451	3.50	440	2.40	230
4.....	1.40	116	3.85	518	3.55	451	3.50	440	2.50	235
5.....	1.40	116	3.85	518	3.55	451	3.50	440	2.40	234
6.....	1.40	116	3.85	518	3.55	451	3.50	440	2.40	233
7.....	1.40	116	3.85	518	3.55	451	3.50	440	2.40	240
8.....	1.40	116	3.85	518	3.55	451	3.50	440	2.70	244
9.....	1.40	116	3.85	518	3.60	462	1.80	160	2.80	251
10.....	1.50	126	3.85	518	3.60	462	1.80	160	2.90	255
11.....	1.50	126	3.85	518	3.60	600	1.80	160	3.00	258
12.....	1.50	126	3.85	518	4.20	600	1.10	87	2.90	259
13.....	1.50	126	3.85	518	4.20	600	1.10	87	2.50	260
14.....	1.50	126	3.85	518	4.20	600	1.10	87	3.00	261
15.....	1.50	126	3.85	518	4.20	600	2.10	200	3.20	264
16.....	1.50	126	3.85	518	4.20	600	3.00	344 <sup>a</sup>	3.10	264
17.....	1.50	126	3.85	518	4.20	600	3.00	344	3.10	264
18.....	1.50	126	3.85	518	4.20	600	2.50	260	3.10	265
19.....	1.50	126	3.85	518	4.20	600	2.50	260	3.10	265
20.....	1.50	126	3.85	518	4.20	600	2.50	260	3.10	264
21.....	1.50	126	3.85	518	4.20	600	2.50	260	3.10	265
22.....	1.50	126	3.85	518	4.20	600	2.50	260	3.10	264
23.....	1.50	126	3.85	518	4.20	600	2.50	260	3.10	263
24.....	1.50	126	3.85	518	4.20	600	2.50	260	3.20	262
25.....	1.50	126	3.85	518	4.20	600	2.90	316	3.20	262
26.....	1.50	126	3.85	518	4.20	600	2.50	260	3.20	262
27.....	1.50	126	3.95	540	4.20	600	2.50	259	3.20	262
28.....	1.50	126	3.95	540	5.00	792	2.50	258	3.20	261
29.....	1.50	126	3.95	540	5.05	804	2.50	257	3.10	260
30.....	1.50	126	3.95	540	3.50	440	2.50	250	2.90	259
31.....	1.50	126	.....	.....	3.50	440	.....	.....	2.90	257

<sup>a</sup> Ice conditions after Nov. 15.

MONTHLY DISCHARGE of East Branch of Canadian Pacific Railway Company Canal near Bassano, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (18-30).....	260	78	186	4,795
May.....	186	96	107	6,579
June.....	96	96	96	5,712
July.....	148	78	114	7,010
August.....	126	116	124	7,624
September.....	540	309	509	30,288
October.....	804	344	550	33,818
November.....	440	87	286	17,018
December.....	265	172	253	15,556
The period.....				138,400

## BOW RIVER NEAR BASSANO.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 2, Tp. 21, Rge. 19, W. 4th Mer., about one-half mile downstream from Canadian Pacific Railway Company's dam, and about three miles southwest of the town of Bassano.

*Records available.*—August 20, 1909, to December 31, 1915.

*Gauge.*—Vertical staff, on left bank at gauging station. Elevation of zero of gauge 2,519.43 feet during 1909-10. Elevation of zero of gauge 2,517.90 feet during 1911-12. Elevation of zero of gauge 2,513.60 feet during 1913. Elevation of zero of gauge 2,510.68 during 1914-15.

*Bench-mark.*—Permanent iron bench-mark. Elevation, 2,524.29 feet. (Canadian Pacific Railway Company's datum.)

*Channel.*—Permanent.

*Discharge measurements.*—Made from a cable.

*Winter flow.*—Records taken during winter season.

*Artificial control.*—Formed by Canadian Pacific Railway Company's dam one-half mile upstream.

*Diversions.*—Eastern Section of Canadian Pacific Railway Company's irrigation canal diverts water about one-half mile upstream.

*Co-operation.*—Gauge height supplied by Canadian Pacific Railway Company.

#### DISCHARGE MEASUREMENTS of Bow River near Bassano, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 7	R. J. McGuinness	496	2,056	0.76	2.79	1,563
Jan. 19	H. S. Kerby	460	1,620	0.76	1.92	1,232
May 7	R. J. McGuinness	583	1,648	2.97	4.00	4,892
May 27	do	603	3,484	3.06	5.32	10,642
June 27	do	800	9,531	6.12	14.70	69,191
June 28	do	614	7,974	5.75	11.91	45,896
June 29	do	633	6,166	6.04	9.79	37,557
June 30	do	620	5,661	5.77	8.95	32,672
July 1	do	620	5,361	5.73	8.47	30,720
July 2	do	621	5,483	5.73	8.66	31,425
Aug. 23	H. B. R. Thompson	602	4,011	3.50	5.96	14,541
Sept. 18	do	585	2,378	1.80	3.66	4,278
Oct. 21	do	582	2,108	1.56	3.23	3,296
Nov. 24	F. K. Beach	485	1,266	0.506	1.35	641
Dec. 20	do	500	1,601	0.78	2.04	1,244

#### DAILY GAUGE HEIGHT AND DISCHARGE of Bow River near Bassano, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2.405	1,200	2.10	1,200	..... <sup>a</sup>	.....	.....	.....	2.61	2,115	5.22	10,600
2	2.20	1,000	1.90 <sup>b</sup>	1,200	..... <sup>a</sup>	.....	.....	.....	3.11	3,020	5.22	10,600
3	2.60	1,400	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	3.71	4,530	5.32	11,100
4	2.40	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	3.30	3,450	4.11	5,885	5.92	14,360
5	2.40	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	3.91	5,185	5.62	12,710
6	2.90	1,800	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	.....	.....	4.01	5,535	5.42	11,610
7	2.93	1,800	2.20	1,500	2.20	1,500	.....	.....	4.11	5,885	5.62	12,160
8	2.50	1,300	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	.....	.....	3.91	5,185	5.42	11,610
9	2.30	1,300	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	.....	.....	4.91	9,195	5.82	13,810
10	2.10	1,300	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	5.11	10,095	5.72	13,260
11	2.10	1,290	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	2.80	2,400	5.01	9,645	5.62	12,710
12	2.30	1,280	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	..... <sup>a</sup>	.....	5.41	11,555	5.32	11,100
13	2.30	1,270	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	.....	.....	4.71	8,295	5.22	10,600
14	2.40	1,260	2.20	1,500	2.00	1,300	.....	.....	6.41	17,260	5.22	10,600
15	2.50	1,250	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	.....	.....	6.31	16,660	5.32	11,100
16	2.40	1,240	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	.....	.....	6.20	16,000	5.22	10,600
17	2.20	1,220	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	5.80	13,700	5.22	10,600
18	2.00	1,210	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	1.80	1,100	5.60	12,050	5.52	12,160
19	1.90	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	5.40	11,500	6.72	19,120
20	1.90	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	..... <sup>a</sup>	.....	5.20	10,500	6.92	20,320
21	2.20	1,200	2.30	1,650	3.15	3,100	2.41	1,815	4.80	8,700	6.92	20,320
22	2.30	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	2.11	1,410	4.60	7,800	6.72	19,120
23	2.20	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	2.51	1,965	4.60	7,800	6.52	17,920
24	2.10	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	2.91	2,620	4.90	9,150	6.42	17,320
25	2.10	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	2.71	2,265	5.20	10,500	6.22	16,120
26	2.10	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	2.51	1,965	5.60	12,600	6.52	17,920
27	2.10	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	3.01	2,820	5.72	13,260	14.70	69,156
28	2.10	1,200	2.00	1,300	2.70	2,250	2.71	2,265	5.42	11,610	12.26	53,833
29	2.00	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	..... <sup>a</sup>	2.81	2,420	5.22	10,600	9.79	38,321
30	1.90	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	2.71	2,265	5.12	10,140	9.02	33,486
31	2.10	1,200	..... <sup>a</sup>	.....	..... <sup>a</sup>	.....	.....	.....	5.52	12,160	.....	.....

<sup>a-a</sup> Gates closed.

<sup>b-b</sup> Winter conditions.



Bow River in flood at Calgary, on June 26, 1915. Looking downstream at Langevin bridge, about two hours before the maximum stage was reached. Taken by R. J. Burley.



Bow River in flood at Calgary, on June 26, 1915. Looking at St. George Island Park, about two hours before the maximum stage was reached. Taken by R. J. Burley.





## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Bow River near Bassano, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	8.47	30,032	6.83	19,780	5.04	9,780	3.46	3,850	2.98	2,760	1.94	1,240
2.....	8.58	30,722	6.68	18,880	4.94	9,330		a	3.28	3,409	1.84	1,140
3.....	8.08	27,582	6.63	18,580	4.39	6,960	3.36	3,600	3.33	3,525	2.24	1,560
4.....	7.68	25,070	6.48	17,680	4.18	6,130	3.16	3,120	3.09	2,980	2.24	1,560
5.....	7.38	23,186	6.13	16,580	4.33	6,720	3.46	3,950	2.89	2,580	2.24	1,560
6.....	7.28	22,558	6.11	15,460	4.18	6,130	3.66	4,380	2.74	2,310	1.94	1,240
7.....	7.23	22,244	5.93	14,415	4.12	5,920	3.66	4,380	2.99	2,780	2.64	2,160
8.....	7.23	22,244	5.73	13,315	4.17	6,095	3.71	4,530	2.89	2,580	2.24	1,560
9.....	7.23	22,244	5.53	12,215	4.87	9,015	3.66	4,380	2.74	2,310	2.14	1,440
10.....	6.88	20,080	5.33	11,150	4.46	7,240	3.56	4,100	2.79	2,385	2.54	2,010
11.....	6.68	18,880	5.23	10,650	4.06	5,710	3.46	3,850	2.59	2,085	1.94	1,240
12.....	10.60	43,408	5.18	10,410	4.02	5,530	3.46	3,850	2.49	1,935	1.84	1,140
13.....	10.35	41,838	5.13	10,185	3.95	5,325	3.46	3,850	1.49	1,935	2.14	1,440
14.....	10.20	40,896	5.03	9,735	3.50	3,950	3.36	3,600	1.74	1,040	2.04	1,340
15.....	10.28	41,398	5.03	9,735	3.99	5,465	3.36	3,600	1.64	940	2.14	1,440
16.....	9.68	37,630	4.93	9,285	3.64	4,320	3.01	2,820	2.04	1,340	2.04	1,340
17.....	10.08	40,142	4.93	9,285	3.60	4,470	3.11	3,020	1.74	1,040	2.14	1,440
18.....	9.73	37,944	4.88	9,060	3.54	4,050	3.26	3,350	1.54	840	2.34	1,710
19.....	9.68	37,630	4.93	9,285	4.19	6,165	3.21	3,225	3.04	2,880	2.24	1,560
20.....	8.48	30,094	5.03	9,735	4.06	5,710	3.16	3,120	2.79	2,385	2.00	1,300
21.....	7.88	26,326	6.73	19,180	3.96	5,360	3.16	3,120	2.74	2,310	2.05	1,350
22.....	6.93	20,380	7.23	22,244	3.86	5,010	2.96	2,720	2.64	2,160	1.95	1,250
23.....	6.83	19,780	6.03	14,980	3.71	4,530	3.06	2,920	2.54	2,010	1.95	1,250
24.....	6.63	18,880	5.40	11,500	3.76	4,680	2.98	2,760	2.14	1,440	1.85	1,150
25.....	6.68	18,880	5.25	10,750	3.91	5,185	2.93	2,660	2.74	2,310	1.85	1,150
26.....	6.63	18,580	5.15	10,275	3.96	5,360	2.98	2,760	3.24	3,300	1.95	1,250
27.....	6.70	19,000	4.95	9,375	4.06	5,710	2.98	2,760	3.34	3,550	2.05	1,350
28.....	6.92	20,320	4.90	8,250	4.16	6,060		a	2.64	2,160	1.95	1,250
29.....	7.63	24,756	4.55	7,600	3.96	5,360	2.73	2,295	2.34	1,710	1.75	1,050
30.....	7.23	22,244	4.70	8,250	3.96	5,360	2.68	2,220	2.04	1,340	1.45	750
31.....	6.95	20,500	4.60	7,800			2.78	2,370			1.55	850

a Gates closed.

## MONTHLY DISCHARGE of Bow River near Bassano, for 1915.

(Drainage area 7,613 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,800	1,000	1,262	0.1660	0.19	77,597
February.....	1,650	1,200	298	0.0391	0.04	16,550
March.....	3,100	1,300	263	0.0345	0.04	16,171
April.....	3,450	1,100	959	0.1260	0.14	57,664
May.....	17,260	2,115	9,617	1.2600	1.45	591,356
June.....	60,156	10,600	18,475	2.4300	2.51	1,099,888
July.....	43,408	18,580	27,273	3.5800	4.13	1,576,931
August.....	22,244	7,600	12,407	1.6300	1.88	762,876
September.....	9,780	3,950	5,888	0.7730	0.86	330,460
October.....	4,530	2,220	3,131	0.4110	0.47	192,518
November.....	3,550	840	2,211	0.2900	0.29	121,994
December.....	2,160	750	1,357	0.1790	0.21	88,439
The year.....					17.44	8,063,784

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Bow River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
June 3....	H. C. Ritchie.....	Beaupré Creek....	SE. 15-26-5-5....	10.5	6.12	1.95	11.90
June 18....	do .....	do .....	do .....	9.5	5.40	1.70	9.10
Aug. 6....	do .....	do .....	do .....	16.0	8.50	1.48	12.50
Aug. 27....	do .....	do .....	do .....	14.0	5.60	1.03	5.70
Sept. 22....	do .....	do .....	do .....	14.0	5.20	0.93	4.80
Oct. 28....	do .....	do .....	do .....	11.0	4.10	0.94	3.90
June 3....	do .....	Bighill Creek....	SW. 10-26-4-5....	12.7	13.30	3.23	43.00
June 18....	do .....	do .....	do .....	12.0	9.60	2.23	21.00
Aug. 6....	do .....	do .....	do .....	14.0	17.40	2.96	52.00
Aug. 27....	do .....	do .....	do .....	13.7	16.40	2.83	47.00
Sept. 22....	do .....	do .....	do .....	13.3	14.20	2.71	39.00
Oct. 28....	do .....	do .....	do .....	12.3	11.00	2.22	24.00
Oct. 1....	H. B. R. Thompson	C.P.R. Canal (at Syphon Antelope Coulee)					
Aug. 7....	H. C. Ritchie.....	Chiniki Creek....	NW. 9-18-16-4.... 2 miles E. of Morley (Ind. Reserve)...	60.6	244.00	2.47	603.00
Aug. 5....	H. B. R. Thompson	Fish Creek (S. Branch)	SE. 22-22-3-5....	9.6	12.00	1.93	23.00
Sept. 4....	do .....	do .....	do .....	22.0	46.40	2.29	106.00
Oct. 2....	do .....	do .....	do .....	25.0	17.00	0.99	16.80
June 3....	H. C. Ritchie.....	Grand Valley Creek	SW. 24-26-5-5....	32.0	25.60	1.31	34.00
June 18....	do .....	do .....	do .....	22.0	22.70	2.05	46.00
Aug. 6....	do .....	do .....	do .....	22.0	18.80	1.68	32.00
Aug. 27....	do .....	do .....	do .....	25.0	24.00	2.03	49.00
Sept. 22....	do .....	do .....	do .....	17.4	13.80	1.33	18.40
Oct. 28....	do .....	do .....	do .....	16.0	10.40	1.21	12.60
June 3....	do .....	Horse Creek....	NE. 8-26-4-5....	14.0	8.10	0.90	7.20
June 18....	do .....	do .....	do .....	16.5	14.60	1.35	19.70
Aug. 6....	do .....	do .....	do .....	15.4	13.50	1.28	17.30
Aug. 27....	do .....	do .....	do .....	18.0	15.00	1.56	23.00
Sept. 22....	do .....	do .....	do .....	17.5	13.50	0.99	13.40
Oct. 28....	do .....	do .....	do .....	17.0	11.40	0.77	8.80
Jan. 11....	do .....	Lake Louise (Tail Race of Power House)....	NE. 20-28-16-5....	16.0	8.55	0.56	4.80
Jan. 28....	do .....	do .....	do .....	2.5	3.35	1.99	6.70
Jan. 28....	do .....	do .....	do .....	2.5	1.90	0.86	1.64
Feb. 8....	do .....	do .....	do .....	2.5	3.15	1.96	6.20
Feb. 24....	do .....	do .....	do .....	2.5	1.65	0.67	1.11
Mar. 10....	do .....	do .....	do .....	2.5	1.42	0.57	0.81
Mar. 24....	do .....	do .....	do .....	2.5	1.42	0.57	0.81
April 22....	O. H. Hoover	do .....	do .....	2.5	1.42	0.48	0.68
May 13....	H. C. Ritchie.....	do .....	do .....	2.5	2.00	0.36	0.72
May 26....	do .....	do .....	do .....	2.5	4.15	2.11	8.80
June 9....	do .....	do .....	do .....	2.5	4.25	2.09	8.90
June 23....	do .....	do .....	do .....	2.5	4.25	2.09	8.90
July 20....	do .....	do .....	do .....	...	...	...	12.20a
Aug. 18....	do .....	do .....	do .....	...	...	...	12.10a
Sept. 2....	do .....	do .....	do .....	8.2	4.10	1.17	4.80
Oct. 1....	do .....	do .....	do .....	...	...	...	10.30a
Oct. 20....	do .....	do .....	do .....	...	...	...	10.10a
Nov. 2....	do .....	do .....	do .....	...	...	...	9.10a
Dec. 4....	J. E. Caughey....	do .....	do .....	8.4	2.31	2.00	4.60a
Dec. 16....	H. C. Ritchie.....	do .....	do .....	...	...	...	6.10
June 26....	H. B. R. Thompson	Lineham Spillway..	NW. 6-19-28-4....	6	161.00	17.79	2862.00
Sept. 8....	do .....	do .....	do .....	27.8	27.70	1.27	35.00
Oct. 8....	do .....	do .....	do .....	11.2	10.90	1.55	16.90
Nov. 10....	F. K. Beach.....	do .....	do .....	...	...	...	Nil.c
June 3....	H. C. Ritchie.....	Spencer Creek....	SE. 18-26-5-5....	10.5	4.22	1.66	7.00
June 18....	do .....	do .....	do .....	9.4	3.85	1.72	6.60
Aug. 6....	do .....	do .....	do .....	22.7	20.10	2.18	44.00
Aug. 27....	do .....	do .....	do .....	20.5	13.80	1.62	22.00
Sept. 22....	do .....	do .....	do .....	20.0	13.10	1.54	20.00
Oct. 28....	do .....	do .....	do .....	9.4	8.78	1.14	10.00
Jan. 15....	do .....	Whiteman Creek..	NW. 24-24-11-5....	16.0	19.60	0.31	6.00
Jan. 23....	do .....	do .....	do .....	16.0	19.60	0.32	6.40
Feb. 6....	do .....	do .....	do .....	16.2	20.60	0.32	6.60
Feb. 25....	do .....	do .....	do .....	16.0	20.40	0.32	6.60
Mar. 12....	do .....	do .....	do .....	16.0	20.10	0.28	5.60
Mar. 26....	do .....	do .....	do .....	9.7	11.50	0.52	6.00
April 9....	do .....	do .....	do .....	9.7	11.30	0.45	5.10
April 23....	O. H. Hoover	do .....	do .....	9.7	11.80	0.53	6.30
May 14....	H. C. Ritchie.....	do .....	do .....	9.9	12.40	0.55	6.80
June 14....	do .....	do .....	do .....	10.0	13.80	0.61	8.40
Aug. 23....	do .....	do .....	do .....	10.5	6.30	1.78	11.20
Sept. 20....	do .....	do .....	do .....	10.5	6.08	1.68	10.20
Nov. 5....	do .....	do .....	do .....	10.4	5.57	1.56	8.70

a Weir measurement.

b Slope measurement.

c No water running (pools frozen).

## LITTLE BOW RIVER DRAINAGE BASIN.

*General Description.*

The source of Little Bow River is a spring in the town of High River in Sec. 6, Tp. 19, Rge. 28, W. of the 4th Mer. From here it flows in a southeasterly direction for one hundred miles and empties into the Oldman River. In the first few miles, the natural flow is dependent entirely on a number of small springs and coulees which are dry most of the year, but later is augmented by the flow from Mosquito Creek, which drains the south and westerly part of the drainage basin.

There is a comparatively large flow in this stream during the spring freshets, but during summer it would, under natural conditions, dry up. There are a large number of ranchers and settlers on this stream and it is very important that there should be a good flow for domestic and stock watering purposes. For this reason, the Provincial Government has constructed a canal and diverts water from Highwood River into Little Bow River whenever required.

## MOSQUITO CREEK NEAR NANTON.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 30, Tp. 16, Rge. 28, W. 4th Mer., about four miles from Nanton.

*Records available.*—August 1, 1908, to October 31, 1915. Discharge measurements only 1906–1908.

*Gauge.*—Vertical staff. Elevation of zero maintained at 89.22 feet during 1908–1912, and at 89.47 feet during 1913–15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Liable to shift.

*Discharge measurements.*—Made with meter from the bridge at flood stages; by wading during low water.

*Winter flow.*—Station not maintained during the winter.

*Observer.*—Wm. Monkman.

## DISCHARGE MEASUREMENTS of Mosquito Creek near Nanton, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 17.....	P. H. Daniells.....	41	42.0	1.67	3.40	70.0
April 2.....	do.....	18	10.8	1.02	2.43	11.1
April 14.....	do.....	17	7.4	0.80	2.20	6.0
April 28.....	do.....	14	5.4	0.62	2.05	3.4
May 15.....	W. R. McCaffrey.....	50	61.5	4.02	3.61	258.0
May 28.....	do.....	39	51.0	1.04	2.75	53.0
June 12.....	do.....	39	42.0	1.60	2.86	67.0
June 24.....	do.....	43	64.0	2.08	3.16	134.0
July 10.....	do.....	56	63.0	2.82	3.30	179.0
July 29.....	do.....	59	65.0	3.12	3.45	204.0
Aug. 14.....	do.....	39	69.0	0.99	2.91	68.0
Sept. 16.....	do.....	30	23.0	2.02	2.62	47.0
Oct. 6.....	W. H. Hannon.....	32	24.0	2.20	2.65	50.0
Oct. 23.....	W. R. McCaffrey.....	27	19.4	1.26	2.55	34.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Mosquito Creek near Nanton, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			2.30	10.0	2.35	13.0	2.58	32
2.			2.20	6.0	2.48	22.0	2.55	29
3.			2.08	3.6	2.45	20.0	2.85	68
4.			2.08	3.6	2.48	22.0	3.05	108
5.			2.15	4.9	2.43	18.4	3.03	104
6.			2.10	3.8	2.40	16.0	3.02	101
7.			2.17	5.3	2.35	13.0	3.10	119
8.			2.17	5.3	2.31	10.6	3.15	131
9.			2.17	5.3	2.26	8.4	2.90	77
10.			2.16	5.1	2.20	6.0	2.89	75
11.			2.15	4.9	2.20	6.0	2.85	68
12.			2.17	5.3	2.35	13.0	2.86	70
13.			2.15	4.9	2.43	18.4	2.92	81
14.			2.20	6.0	3.60	254.0	2.95	87
15.	3.54	180.0a	2.17	5.3	3.61	257.0	2.98	93
16.	3.56	205.0	2.18	5.6	3.50	224.0	3.00	97
17.	3.61	215.0	2.15	4.9	3.42	202.0	3.02	101
18.	3.56	220.0	2.20	6.0	3.35	182.0	3.43	204
19.	3.51	227.0a	2.20	6.0	3.20	143.0	3.63	264
20.	3.56	242.0	2.20	6.0	3.03	104.0	3.80	319
21.	3.36	185.0	2.17	5.3	3.00	97.0	4.00	385
22.	3.26	159.0	2.15	4.9	2.88	74.0	3.51	227
23.	2.91	79.0	2.15	4.9	2.85	68.0	3.21	146
24.	2.79	59.0	2.12	4.2	2.88	74.0	3.25	156
25.	2.73	50.0	2.15	4.9	2.90	77.0	3.20	143
26.	2.71	47.0	2.15	4.9	2.88	74.0	7.60	1,573
27.	2.70	46.0	2.12	4.2	2.85	68.0	6.80	1,309
28.	2.64	39.0	2.08	3.6	2.80	60.0	5.70	946
29.	2.59	33.0	2.10	3.8	2.75	53.0	3.80	319
30.	2.53	27.0	2.20	6.0	2.69	45.0	3.65	270
31.	2.34	12.4	.....	.....	2.63	38.0	.....	.....

a-a Estimated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Mosquito Creek near Nanton, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.71	289	3.42	202	2.63	38	2.61	35
2.....	3.64	267	3.31	172	2.70	46	2.60	34
3.....	3.51	227	3.10	119	2.70	46	2.64	39
4.....	3.45	210	3.02	101	2.67	42	2.67	42
5.....	3.37	188	2.95	87	2.65	40	2.66	41
6.....	3.34	180	2.95	87	2.63	44	2.65	40
7.....	3.30	169	2.93	83	2.89	75	2.65	40
8.....	4.00	385	2.93	83	2.87	72	2.65	40
9.....	3.53	233	2.92	81	2.76	54	2.65	40
10.....	3.48	218	2.92	81	2.62	36	2.66	41
11.....	3.40	196	2.91	79	2.62	36	2.65	44
12.....	3.28	164	2.90	77	2.63	38	2.66	41
13.....	3.11	121	2.90	77	2.63	38	2.67	42
14.....	3.13	126	2.91	79	2.65	40	2.71	47
15.....	3.43	204	2.89	75	2.62	36	2.69	45
16.....	3.97	375	2.87	72	2.62	36	2.66	41
17.....	4.13	428	2.85	68	2.62	36	2.64	39
18.....	4.58	576	3.01	99	2.62	36	2.64	39
19.....	4.01	388	3.15	131	2.62	36	2.62	36
20.....	3.43	204	4.30	484	2.62	36	2.60	34
21.....	3.16	133	3.63	264	2.62	36	2.58	32
22.....	3.14	129	3.05	108	2.62	36	2.56	30
23.....	3.19	141	2.97	91	2.73	50	2.55	29
24.....	3.21	146	2.89	75	3.00	97	2.55	29
25.....	3.24	153	2.85	68	2.85	68	2.55	29
26.....	3.29	166	2.81	62	2.70	46	2.54	28
27.....	3.26	159	2.76	54	2.65	40	2.54	28
28.....	3.59	251	2.73	50	2.65	40	2.53	27
29.....	3.44	207	2.73	50	2.63	38	2.52	26
30.....	3.37	188	2.71	47	2.63	38	2.52	26
31.....	3.59	251	2.63	38	.....	.....	2.52	26

## MONTHLY DISCHARGE of Mosquito Creek near Nanton, for 1915.

(Drainage area 186 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
March (15-31).....	242	12 4	119.0	0 640	0 40	4,013
April.....	10	3.6	5.1	0 274	0 31	803
May.....	257	6.0	74.0	0 398	0 46	4,580
June.....	1,573	29.0	257.0	1 382	1 54	15,793
July.....	576	121.0	228.0	1 226	1 40	14,019
August.....	484	38.0	105.0	0 564	0 65	6,456
September.....	97	36.0	45.0	0 242	0 27	2,678
October.....	47	26.0	36.0	0 194	0 32	2,214
The period.....					5 25	49,526

## NANTON CREEK NEAR NANTON

*Location*.—On the SE.  $\frac{1}{4}$  Sec. 19, Tp. 16, Rge. 28, W. 4th Mer., at highway bridge*Records available*.—August 3, 1908, to October 31, 1915.*Gauge*.—Vertical staff. Zero of gauge maintained at 82.18 feet during 1908-11. Zero of gauge maintained at 82.57 feet during 1912. Zero of gauge maintained at 93.33 feet during 1913. Zero of gauge maintained at 92.31 feet during 1914-15.

*Bench-mark.*—Permanent iron bench-mark.

*Channel.*—Not liable to shift.

*Discharge measurements.*—Made upstream by wading.

*Observer.*—W. Monkman.

DISCHARGE MEASUREMENTS of Nanton Creek near Nanton, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 17.....	P. H. Daniells.....	13.0	11.6	0.76	4.28	8.80
April 2.....	do.....	9.0	3.1	0.84	2.00	2.60
April 14.....	do.....	7.5	2.9	0.84	1.74	2.40
April 28.....	do.....	7.0	2.2	0.61	1.69	1.32
May 15.....	W. R. McCaffrey.....	14.0	33.7	1.78	4.24	60.00
May 28.....	do.....	11.0	12.2	1.24	2.56	15.20
June 12.....	do.....	12.0	23.0	1.42	3.47	35.00
June 24.....	do.....	13.0	28.0	1.50	3.80	42.00
July 10.....	do.....	14.0	39.0	1.68	4.33	66.00
July 29.....	do.....	19.0	45.0	1.39	4.35	68.00
Aug. 14.....	do.....	11.0	18.5	1.36	2.90	25.00
Sept. 16.....	do.....	12.0	11.8	1.25	2.50	14.70
Oct. 6.....	W. H. Hannon.....	13.5	14.9	1.14	2.58	17.00

DAILY GAUGE HEIGHT AND DISCHARGE of Nanton Creek near Nanton, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....				11.00b	1.86	3.5	2.28	9.8
2.....			2.00	5.40	1.88	3.8	2.98	24.0
3.....			1.82	3.00	1.86	3.5	4.04	55.0
4.....			1.80	2.80	1.84	3.3	3.68	43.0
5.....			1.80	2.80	1.83	3.2	3.38	34.0
6.....			1.76	2.40	1.80	2.8	3.12	28.0
7.....			1.75	2.30	1.77	2.5	3.04	26.0
8.....			1.75	2.30	1.74	2.2	3.13	28.0
9.....			1.70	1.80	1.73	2.1	3.01	25.0
10.....			1.70	1.80	1.74	2.2	2.90	22.0
11.....			1.70	1.80	1.73	2.1	2.71	18.0
12.....			1.70	1.80	1.72	2.0	3.47	37.0
13.....			1.70	1.80	1.74	2.2	2.83	21.0
14.....			1.70	1.80	3.99	53.0	4.13	58.0
15.....	4.76	40a	1.70	1.80	4.24	62.0	3.98	52.0
16.....	4.50	46	1.71	1.90	4.23	62.0	3.68	43.0
17.....	4.45	52a	1.71	1.90	4.03	54.0	3.38	34.0
18.....	4.40	68	1.71	1.90	3.63	41.0	4.43	70.0
19.....	4.20	60	1.71	1.90	3.33	33.0	5.83	125.0
20.....	3.50	37	1.71	1.90	3.18	29.0	4.73	81.0
21.....	3.40	35	1.72	2.00	3.03	25.0	4.03	54.0
22.....	3.30	32	1.72	2.00	2.78	20.0	3.95	52.0
23.....	3.20	30	1.71	1.90	2.72	18.0	3.88	49.0
24.....	3.05	26	1.71	1.90	2.70	18.0	3.80	46.0
25.....	2.96	24	1.72	2.00	3.03	25.0	3.63	41.0
26.....	2.87	22	1.72	2.00	2.93	23.0	7.92	209.0
27.....	2.87	22	1.71	1.90	2.75	19.0	6.73	161.0
28.....	2.85	21	1.72	2.00	2.68	17.6	5.73	121.0
29.....	2.82	21	1.74	2.20	2.56	15.1	5.38	107.0
30.....		20b	1.82	3.00	2.45	12.9	5.18	99.0
31.....		20			2.33	10.6		

a to a Estimated.

b to b Estimated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Nanton Creek near Nanton, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.43	109	3.73	44.0	2.63	16.5	2.42	12.2
2.....	5.13	99	3.64	42.0	2.63	16.5	2.42	12.3
3.....	5.01	93	3.43	37.0	2.61	16.1	2.49	13.7
4.....	4.82	85	3.36	34.0	2.61	16.1	2.53	14.5
5.....	4.71	81	3.26	31.0	2.61	16.1	2.49	13.7
6.....	4.60	76	3.26	31.0	2.59	15.7	2.49	13.7
7.....	5.05	94	3.23	30.0	2.78	19.7	2.48	13.5
8.....	5.35	106	3.21	30.0	2.73	18.6	2.47	13.3
9.....	4.98	91	3.08	27.0	2.64	16.7	2.49	13.7
10.....	4.13	58	2.98	24.0	2.56	15.1	2.51	14.1
11.....	3.85	48	2.92	23.0	2.51	14.1	2.49	13.7
12.....	3.83	47	2.88	22.0	2.52	14.3	2.49	13.7
13.....	3.93	51	2.83	21.0	2.51	14.1	2.53	14.5
14.....	4.04	55	2.87	22.0	2.51	14.1	2.58	15.5
15.....	4.26	63	2.94	21.0	2.50	13.9	2.52	14.3
16.....	4.93	89	2.82	21.0	2.50	13.9	2.48	13.5
17.....	5.04	94	2.93	23.0	2.49	13.7	2.46	13.1
18.....	4.33	66	2.98	24.0	2.48	13.5	2.45	12.9
19.....	4.01	54	3.04	26.0	2.48	13.5	2.46	13.1
20.....	3.74	45	6.03	133.0	2.46	13.1	2.45	12.9
21.....	3.48	37	4.03	54.0	2.45	12.9	2.44	12.7
22.....	3.53	38	3.13	28.0	2.45	12.9	2.42	12.3
23.....	4.23	62	2.93	23.0	2.83	21.0	2.35	11.0
24.....	4.24	62	2.92	23.0	3.37	34.0	2.35	11.0
25.....	4.18	60	2.88	22.0	3.03	25.0	2.34	10.8
26.....	3.78	46	2.83	21.0	2.85	21.0	2.34	10.8
27.....	3.72	44	2.79	20.0	2.69	17.8	2.32	10.5
28.....	4.88	87	2.73	19.0	2.54	14.7	2.30	10.1
29.....	4.38	68	2.71	18.0	2.50	13.9	2.29	9.9
30.....	4.03	54	2.67	17.3	2.44	12.7	2.28	9.8
31.....	3.63	41	2.64	16.7			2.27	9.6

## MONTHLY DISCHARGE of Nanton Creek near Nanton, for 1915.

(Drainage area 46 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (15-31).....	68.0	20.00	34.0	0.739	0.47	1,146
April.....	11.0	1.80	2.5	0.054	0.06	149
May.....	62.0	2.00	18.5	0.402	0.46	1,138
June.....	209.0	9.80	5.9	1.283	1.43	3,511
July.....	109.0	37.00	68.0	1.478	1.70	4,181
August.....	133.0	16.70	39.0	0.652	0.75	1,845
September.....	34.0	12.70	16.4	0.387	0.40	976
October.....	18.5	9.60	12.6	0.274	0.32	775
The period.....					8.59	13,731



OLDMAN RIVER DRAINAGE BASIN.

General Description.

The Oldman River is the largest of the two streams which on their junction form the South Saskatchewan River.

The main river is formed between the Rocky Mountains and Livingstone Range by the junction of Livingstone River, Northwest Branch, West Branch and Racehorse Creek. It first flows southeasterly until joined by the Crowsnest and Castle Rivers and then flows in a general eastern direction to its junction with the Bow River. There are a number of small tributaries joining the main stream and two large ones, the Belly River and the St. Mary River. These two streams empty into the river between Macleod and Lethbridge, and full descriptions of their basins are given elsewhere in this report.

The territory drained by this stream consists of mountains, foothills and prairie. The mountain region is quite extensive and is divided into the main range and the Livingstone Range of the Rocky Mountains. There is a good forest cover on many parts of the mountains and foothills, but much of the Livingstone Range and some parts of the Rockies are precipitous and bare of tree growth. On the higher peaks a considerable amount of snow collects and thus the streams are subject to high water caused by melting snows during the heat of the summer and in the early spring.

Floods of exceptional magnitude only occur after exceptionally heavy rains. The precipitation throughout this basin varies greatly. It is heaviest in the mountains and decreases rapidly towards the eastern edge of the basin where it is rather small. There are no irrigation projects of any size on the main river, although extensive surveys have been carried on with the object of irrigating a large area lying between the main river and the Little Bow River, the water to be diverted west of Macleod. On the smaller tributaries a number of irrigation schemes are now in operation.

A special report upon the floods in this drainage basin is given in Appendix No. 4 of this report.

SUMMIT CREEK AT CROWSNEST.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 12, Tp. 8, Rge. 6, W. 5th Mer., about 1,000 feet upstream from Canadian Pacific Railway Company's concrete dam.

*Records available.*—Discharge measurements only are available from February 21, 1912, to October 16, 1915.

*Gauge.*—Vertical staff, nailed to a tree on the right bank.

*Bench-mark.*—Is a spruce stump on the right bank about 30 feet downstream from the gauge. The elevation is 5.94 feet above the zero of the gauge.

*Channel.*—Fairly permanent with a bed of fine gravel.

*Discharge measurements.*—Are made by wading in high water and by means of a 24-inch weir in low stages.

*Winter flow.*—Discharge measurements are continued throughout the winter.

*Observer.*—No gauge height records are obtained at this station.

DISCHARGE MEASUREMENTS of Summit Creek at Crowsnest, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 22.....	J. E. Caughey.....					0.446a
Feb. 23.....	F. R. Steinberger.....				1.57	0.189a
Mar. 10.....	P. H. Daniels.....				1.54	0.123a
Mar. 22.....	do.....					0.189a
April 6.....	do.....				1.79	1.018a
April 20.....	do.....	5.0	1.75	1.97	2.02	3.400
May 3.....	do.....	7.0	4.10	2.18	2.20	8.000
May 18.....	W. R. McCaffrey.....	9.0	5.30	2.58	2.29	13.600
June 2.....	do.....	5.5	2.55	1.40	1.97	3.600
June 30.....	do.....	6.5	2.85	1.40	1.99	4.000
July 16.....	do.....	5.0	1.80	1.17	1.81	2.100
Aug. 5.....	do.....	6.0	2.50	1.29	1.87	3.230
Sept. 10.....	do.....				1.61	0.173a
Sept. 25.....	do.....				1.63	0.255a
Oct. 16.....	do.....				1.72	0.420a

a Weir measurement.

SESSIONAL PAPER No. 25c

CROWSNEST RIVER NEAR COLEMAN.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 12, Tp. 8, Rge. 5, W. 5th Mer., near Prudent le Gal's house.

*Records available.*—June 13, 1910, to December 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 92.12 feet during 1910-12. Zero maintained at elevation of 92.73 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark, located on left bank at the station. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gravel and slightly shifting.

*Discharge measurements.*—Made from a wooden bridge during high water and by wading during low stages at a point about one mile below the gauge.

*Winter flow.*—Discharge measurements continued during the winter season.

*Observer.*—Prudent le Gal.

DISCHARGE MEASUREMENTS of Crowsnest River near Coleman, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 21.....	J. E. Caughey.....	29	27.3	1.57	1.46	43.0
Feb. 6.....	F. R. Steinberger.....	28	24.0	1.44	1.49	34.0
Feb. 22.....	do.....	30	24.0	1.33	1.32	32.0
Mar. 9.....	P. H. Daniels.....	30	24.0	1.35	1.27	33.0
Mar. 23.....	do.....	34	27.0	1.44	1.34	39.0
April 6.....	do.....	33	29.0	1.62	1.43	47.0
April 17.....	do.....	36	38.0	2.16	1.66	72.0a
May 4.....	do.....	55	71.0	3.65	2.76	210.0a
May 18.....	W. R. McCaffrey.....	55	72.0	3.82	2.83	222.0a
May 31.....	do.....	52	70.0	3.40	2.76	212.0a
June 15.....	do.....	55	105.0	2.42	3.01	254.0
June 30.....	do.....	31	72.0	3.89	3.18	281.0b
July 16.....	do.....	44	51.0	3.41	2.52	175.0
Aug. 3.....	do.....	30	58.0	3.11	2.59	182.0
Aug. 16.....	do.....	29	46.0	2.48	2.16	115.0
Sept. 9.....	do.....	28	42.0	1.80	1.87	75.0
Sept. 24.....	do.....	29	43.0	1.91	1.92	85.0
Oct. 18.....	do.....	26	37.0	1.68	1.72	63.0
Oct. 29.....	do.....	26	38.0	1.61	1.72	61.0
Nov. 13.....	do.....	29	56.2	1.64	2.63	92.0
Nov. 27.....	do.....	30	28.8	1.82	1.63	49.0
Dec. 10.....	do.....	31	24.6	2.06	1.66	51.0
Dec. 27.....	do.....	33	28.9	1.55	2.65	45.0

a Discharges adjusted to allow for small tributaries entering river between gauge and measurement section.

b New measurement section located 200 ft. below gauge.

## DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest River near Coleman, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.75	54	1.74	31	1.24	31	1.39	40	2.73	203	2.96	245
2.....	1.68	54	1.58	32	1.24	32	1.44	43	3.05	261	2.96	245
3.....	1.60	52	1.57	33	1.29	33	1.47	45	3.15	279	2.96	245
4.....	1.82	52	1.56	34	1.29	33	1.49	46	2.73	203	2.96	245
5.....	1.93	51	1.82	34	1.26	33	1.51	48	2.60	182	2.94	241
6.....	1.84	50	1.67	34	1.24	33	1.51	48	2.60	182	2.96	245
7.....	1.75	50	1.56	34	1.24	33	1.52	48	2.72	202	3.01	254
8.....	1.75	50	1.28	34	1.29	33	1.50	47	3.03	257	2.96	245
9.....	1.75	50	1.26	34	1.30	33	1.49	46	3.27	301	2.91	236
10.....	1.73	49	1.29	36	1.33	37	1.49	46	3.62	366	2.91	236
11.....	1.72	49	1.29	37	1.33	37	1.48	45	3.25	297	2.96	245
12.....	1.70	48	1.41	37	1.33	37	1.50	47	3.05	261	2.91	236
13.....	1.62	48	1.67	36	1.31	36	1.52	48	3.05	261	2.73	203
14.....	1.58	48	1.78	35	1.31	36	1.67	59	3.00	252	2.96	245
15.....	1.58	47	1.82	34	1.32	37	1.71	62	2.87	229	3.01	254
16.....	2.04	47	1.88	32	1.32	37	1.86	75	2.83	221	3.06	263
17.....	2.50	46	1.88	31	1.30	36	1.87	76	2.85	225	3.11	272
18.....	3.70	45	1.26	30	1.30	36	1.95	85	2.84	223	3.05	261
19.....	2.64	45	1.26	29	1.30	36	2.20	118	2.85	225	3.05	261
20.....	1.52	44	1.25	29	1.35	38	2.23	123	2.90	234	3.01	254
21.....	1.57	43	1.24	30	1.35	38	2.25	126	2.70	198	2.97	247
22.....	2.75	42	1.29	32	1.35	38	2.25	126	2.70	198	3.01	254
23.....	2.56	41	1.29	33	1.34	38	2.25	126	2.70	198	3.01	254
24.....	2.45	40	1.29	33	1.39	40	2.16	112	2.90	234	3.01	254
25.....	2.95	38	1.26	33	1.61	53	2.12	107	2.86	227	3.11	272
26.....	2.57	36	1.26	33	1.89	78	2.13	108	2.90	234	3.26	299
27.....	2.25	33	1.24	32	1.51	48	1.96	86	2.90	234	3.31	308
28.....	2.10	31	1.24	31	1.29	36	1.95	85	3.02	256	3.11	272
29.....	1.85	30	.....	.....	1.24	34	1.98	89	3.02	256	3.11	272
30.....	1.85	30	.....	.....	1.34	38	2.30	134	3.02	256	3.38	320
31.....	1.85	30	.....	.....	1.36	39	.....	.....	2.96	245	.....	.....

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DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest River near Coleman, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.21	290	2.68	195	1.95	85	1.87	76	1.75	65	1.58	49
2.....	3.19	286	2.68	195	1.90	79	1.89	78	1.75	65	1.58	50
3.....	3.16	281	2.64	188	1.88	77	1.90	79	1.75	65	1.58	50
4.....	3.11	272	2.58	179	1.85	74	1.97	87	1.74	64	1.75	49
5.....	3.10	270	2.46	160	1.85	74	1.99	90	1.75	65	1.65	49
6.....	3.08	266	2.46	160	1.85	74	1.95	85	1.76	66	1.60	49
7.....	3.06	263	2.42	153	1.85	74	1.92	81	1.75	65	1.60	49
8.....	3.06	263	2.42	153	1.82	71	1.90	79	1.75	65	1.62	50
9.....	2.96	245	2.39	148	1.87	76	1.87	76	1.75	65	1.76	51
10.....	2.84	223	2.35	142	1.83	72	1.85	74	1.75	65	1.66	51
11.....	2.81	218	2.32	137	1.80	69	1.81	70	1.75	65	1.63	51
12.....	2.79	214	2.30	134	1.78	67	1.80	69	1.80	71	1.63	50
13.....	2.76	209	2.30	134	1.78	67	1.78	67	2.63	92	1.69	49
14.....	2.74	205	2.28	131	1.78	67	1.75	65	2.10	97	1.65	48
15.....	2.68	195	2.26	128	1.75	65	1.75	65	1.85	73	1.53	46
16.....	2.60	182	2.16	112	1.75	65	1.75	65	1.75	65	1.54	43
17.....	2.53	171	2.14	110	1.75	65	1.73	63	1.75	64	1.45	42
18.....	2.55	174	2.12	107	1.75	65	1.74	64	1.72	62	1.72	41
19.....	2.65	190	2.12	107	1.79	68	1.74	64	1.71	60	1.46	40
20.....	2.68	195	2.10	104	1.79	68	1.75	65	2.10	65	1.37	40
21.....	2.60	182	2.10	104	1.79	68	1.75	65	2.10	74	1.45	42
22.....	2.58	179	2.06	98	1.79	68	1.75	65	2.10	72	1.44	44
23.....	2.55	174	2.04	96	1.80	69	1.75	65	1.60	52	1.51	46
24.....	2.55	174	2.04	96	1.90	79	1.75	65	1.60	49	1.92	46
25.....	2.55	174	2.02	93	1.88	77	1.75	65	1.55	49	1.53	46
26.....	2.50	166	2.02	93	1.85	74	1.75	65	1.67	50	1.88	45
27.....	2.44	156	2.02	93	1.83	72	1.75	65	1.63	49	2.65	45
28.....	2.66	192	1.98	89	1.80	69	1.73	63	1.65	48	2.86	45
29.....	2.89	232	1.95	85	1.83	72	1.72	63	1.67	48	2.80	43
30.....	2.74	205	1.95	85	1.85	74	1.74	64	1.60	48	2.68	41
31.....	2.70	198	1.95	85			1.75	65			1.95	40

MONTHLY DISCHARGE of Crowsnest River near Coleman, for 1915.

(Drainage area 70 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	54	30	44	0.628	0.73	2,708
February.....	37	29	33	0.471	0.49	1,832
March.....	78	31	38	0.543	0.63	2,336
April.....	134	40	76	1.086	1.21	4,322
May.....	366	182	239	3.414	3.93	14,696
June.....	320	203	256	3.657	4.08	15,333
July.....	290	156	214	3.057	3.52	13,158
August.....	195	85	126	1.800	2.08	7,747
September.....	85	65	71	1.014	1.13	4,225
October.....	90	63	70	1.000	1.15	4,304
November.....	97	48	63	0.900	1.04	3,749
December.....	51	40	46	0.657	0.76	2,828
The year.....					20.74	77,333

MCGILLIVRAY CREEK NEAR COLEMAN.

*Location.*—On SE.  $\frac{1}{4}$  of Sec. 7, Tp. 8, Rge. 4, W. 5th Mer., about 150 feet north of Canadian Pacific Railway Company's culvert across the creek.

*Records available.*—Jan. 9, 1913, to June 15, 1915.

*Gauge.*—Vertical staff.

*Bench-mark.*—Stump on left bank about fifty feet downstream from the gauge. Elevation, 2.99 feet above zero of the gauge.

*Channel.*—Gravel and slightly shifting.

*Discharge measurements.*—Made by wading during low stages and from a foot-bridge, during high water.

*Winter-flow.*—Discharge measurements only made during the winter season.

*Observer.*—Mrs. H. G. Perdue.

*Remarks.*—This station was discontinued June 15, 1915, as daily records were not considered of sufficient value to warrant expense of maintenance.

# DISCHARGE MEASUREMENTS of McGillivray Creek near Coleman, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 23.....	P. H. Daniells.....	10	6.0	0.99	1.27	5.9
April 6.....	do.....	11	9.2	1.00	1.40	9.4
April 17.....	do.....	14	11.6	2.00	1.64	23.0
May 4.....	do.....	14	15.6	2.44	1.80	38.0
May 18.....	W. R. McCaffrey.....	16	15.6	2.62	1.73	40.0
May 31.....	do.....	14	12.9	2.22	1.63	29.0
June 30.....	do.....	14	15.0	3.19	1.83	48.0
July 16.....	do.....	13	9.2	1.84	1.50	17.0
Aug. 3.....	do.....	12	7.6	1.55	1.44	12.0
Aug. 16.....	do.....	13	8.0	0.83	1.32	6.6
Sept. 9.....	do.....	10	6.2	0.83	1.25	5.1
Sept. 24.....	do.....	11	6.4	0.91	1.27	5.8
Oct. 18.....	do.....	11	6.4	0.81	1.30	5.2
Dec. 10.....	do.....	9	6.9	0.56	1.34	3.9

# DAILY GAUGE HEIGHT AND DISCHARGE of McGillivray Creek near Coleman, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.83	47	1.65	28.0
2.....			2.03	71	1.63	26.0
3.....			1.87	51	1.63	26.0
4.....			1.83	47	1.63	26.0
5.....			1.83	47	1.61	24.0
6.....			1.84	48	1.59	22.0
7.....			1.84	48	1.59	22.0
8.....			1.87	51	1.57	21.0
9.....			1.92	57	1.57	21.0
10.....			1.93	59	1.54	18.5
11.....	1.60	23.0	1.84	48	1.54	18.5
12.....	1.60	23.0	1.92	57	1.54	18.5
13.....	1.60	23.0	1.92	57	1.57	21.0
14.....	1.61	24.0	1.93	59	1.77	40.0
15.....	1.61	24.0	1.93	59	1.81	44.0
16.....	1.61	24.0	1.85	49		
17.....	1.61	24.0	1.85	49		
18.....	1.62	25.0	1.85	49		
19.....	1.64	27.0	1.83	47		
20.....	1.65	27.0	1.83	47		
21.....	1.65	27.0	1.83	47		
22.....	1.58	22.0	1.81	44		
23.....	1.55	19.3	1.80	43		
24.....	1.53	17.8	1.74	36		
25.....	1.50	15.5	1.72	34		
26.....	1.50	15.5	1.70	32		
27.....	1.51	16.2	1.70	32		
28.....	1.51	16.2	1.70	32		
29.....	1.56	20.0	1.70	32		
30.....	1.83	47.0	1.70	32		
31.....			1.65	28		

a Station discontinued.

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MONTHLY DISCHARGE of McGillivray Creek near Coleman, for 1915.

(Drainage area 16 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (11-30).....	47	15.5	23	1.438	1.07	912
May.....	71	28.0	46	2.875	3.31	2,525
June (1-15).....	44	18.5	25	1.562	0.87	744
The period.....					5.25	5,484

CROWSNEST RIVER NEAR FRANK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 36, Tp. 7, Rge. 4, W. 5th Mer., at the traffic bridge.

*Records available.*—June 13, 1910, to December 31, 1915.

*Gauge.*—Vertical staff.

*Bench-mark.*—A stump on the left bank about four feet from the gauge. Elevation 9 43 feet above the zero of the gauge.

*Channel.*—Gravel and fairly permanent.

*Discharge measurements.*—Made from traffic bridge during high water and by wading in low stages.

*Winter flow.*—Discharge measurements are continued during the winter season.

*Observer.*—I. Wilson.

DISCHARGE MEASUREMENTS of Crowsnest River near Frank, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 19.....	J. E. Caughey.....	49	49	1.31	4.14	64.0
Feb. 8.....	F. R. Steinberger.....	48	45	1.23	4.12	55.0
Feb. 22.....	do.....	49	42	1.18	4.05	50.0
Mar. 9.....	P. H. Daniells.....	49	38	1.18	4.00	44.0
Mar. 24.....	do.....	50	51	1.34	4.18	68.0
April 7.....	do.....	60	74	2.12	4.51	137.0
April 19.....	do.....	68	113	2.98	5.06	336.0
May 8.....	do.....	70	137	4.18	5.70	572.0
May 17.....	W. R. McCaffrey.....	71	137	3.89	5.65	532.0
June 1.....	do.....	68	120	3.65	5.32	438.0
June 16.....	do.....	67	139	3.75	5.54	521.0
June 26.....	do.....	67	161	4.66	5.97	751.0
July 17.....	do.....	66	92	3.06	4.86	282.0
Aug. 3.....	do.....	66	95	2.88	4.86	273.0
Aug. 17.....	do.....	65	74	2.11	4.55	156.0
Sept. 10.....	do.....	61	58	1.63	4.35	94.0
Sept. 25.....	do.....	63	62	1.84	4.41	114.0
Oct. 16.....	do.....	54	54	1.69	4.34	90.0
Oct. 30.....	do.....	65	64	1.79	4.45	115.0
Nov. 12.....	do.....	52	49	1.50	4.33	74.0
Nov. 27.....	do.....	52	48	1.55	4.24	74.0
Dec. 11.....	do.....	51	46	1.48	4.13	65.0
Dec. 27.....	do.....	50	43	1.36	4.03	59.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest River near Frank, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.29	84	4.13	60	4.00	44	4.17	65	5.60	531	5.30	411
2.....	4.28	82	4.13	60	3.95	39	4.25	77	6.70	1,232	5.30	411
3.....	4.28	82	4.14	61	3.98	42	4.75	236	5.95	737	5.28	404
4.....	4.27	81	4.12	58	4.00	44	4.65	198	5.75	610	5.25	394
5.....	4.25	77	4.10	56	4.00	44	4.60	178	5.60	531	5.27	401
6.....	4.24	75	4.12	58	4.00	44	4.55	158	5.50	486	5.24	391
7.....	4.23	74	4.12	58	4.00	44	4.55	158	5.67	517	5.20	377
8.....	4.23	74	4.11	57	4.00	44	4.52	146	5.65	555	5.20	377
9.....	4.22	72	4.11	57	4.00	44	4.50	138	5.75	610	5.17	367
10.....	4.23	74	4.11	57	4.00	44	4.54	154	5.90	704	5.14	357
11.....	4.23	74	4.10	56	4.00	44	4.55	158	5.75	610	5.10	345
12.....	4.22	72	4.08	54	4.00	44	4.70	217	5.55	508	5.10	345
13.....	4.22	72	4.07	52	4.00	44	4.90	285	5.75	610	5.10	345
14.....	4.21	71	4.05	50	4.02	46	4.95	300	5.75	610	5.40	447
15.....	4.20	69	4.05	50	4.03	48	4.94	297	5.70	580	5.50	486
16.....	4.20	69	4.06	51	4.05	50	4.95	300	5.65	555	5.50	486
17.....	4.18	66	4.08	54	4.08	54	5.00	315	5.70	580	5.50	486
18.....	4.15	62	4.08	54	4.08	54	5.03	324	5.90	704	5.50	486
19.....	4.14	61	4.07	52	4.10	56	5.06	333	5.75	610	5.60	531
20.....	4.14	61	4.06	51	4.10	56	5.05	330	5.60	531	5.53	499
21.....	4.15	62	4.05	50	4.12	58	5.00	315	5.50	486	5.45	466
22.....	4.14	61	4.05	50	4.15	62	4.95	300	5.45	466	5.35	429
23.....	4.12	58	4.03	48	4.20	69	4.85	269	5.43	458	5.30	411
24.....	4.10	56	4.02	46	4.18	66	4.83	263	5.42	455	5.30	411
25.....	4.10	56	4.02	46	4.15	62	4.80	253	5.40	447	5.55	508
26.....	4.10	56	4.03	48	4.20	69	4.75	236	5.40	447	5.95	737
27.....	4.08	54	4.05	50	4.16	63	4.74	232	5.35	429	5.80	640
28.....	4.10	56	4.03	48	4.14	61	4.74	232	5.35	429	5.65	555
29.....	4.12	58	.....	.....	4.14	61	4.74	232	5.40	447	5.55	508
30.....	4.12	58	.....	.....	4.14	61	5.10	345	5.35	429	5.50	486
31.....	4.12	58	.....	.....	4.15	62	.....	.....	5.32	418	.....	.....



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DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest River near Frank, for 1915.—*Concluded*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.47	474	5.00	315	4.35	95	4.38	102	4.43	114	4.10	56
2.....	5.45	466	4.92	291	4.37	99	4.50	138	4.43	114	4.08	54
3.....	5.45	466	4.85	269	4.36	97	4.45	120	4.42	112	4.15	62
4.....	5.40	447	4.80	253	4.35	95	4.45	120	4.40	106	4.20	69
5.....	5.35	429	4.75	236	4.35	95	4.45	120	4.40	106	4.24	75
6.....	5.35	429	4.72	225	4.34	93	4.44	117	4.40	106	4.24	75
7.....	5.33	422	4.72	225	4.33	91	4.42	112	4.38	102	4.22	72
8.....	5.29	408	4.70	217	4.33	91	4.40	106	4.38	102	4.24	75
9.....	5.23	387	4.67	206	4.35	95	4.38	102	4.35	95	4.26	79
10.....	5.20	377	4.63	190	4.35	95	4.38	102	4.34	93	4.20	69
11.....	5.10	345	4.60	178	4.34	93	4.37	99	4.27	81	4.20	69
12.....	5.00	315	4.60	178	4.33	91	4.36	97	4.27	81	4.18	66
13.....	4.98	309	4.57	166	4.33	91	4.35	95	4.25	77	4.15	62
14.....	4.98	309	4.55	158	4.32	90	4.35	95	4.25	77	4.12	58
15.....	4.95	300	4.55	158	4.30	86	4.36	97	4.24	75	4.05	50
16.....	4.90	285	4.55	158	4.30	86	4.36	97	4.24	75	3.98	42
17.....	4.88	279	4.55	158	4.30	86	4.35	95	4.23	74	3.93	37
18.....	4.88	279	4.55	158	4.30	86	4.35	95	4.23	74	3.88	33
19.....	4.87	275	4.54	154	4.35	95	4.38	102	4.22	72	4.02	46
20.....	4.85	269	4.53	150	4.34	93	4.38	102	4.22	72	4.03	48
21.....	4.84	266	4.52	146	4.32	90	4.36	97	4.21	71	3.96	40
22.....	4.83	263	4.50	138	4.32	90	4.36	97	4.20	69	4.00	44
23.....	4.82	259	4.50	138	4.35	95	4.35	95	4.20	69	4.00	44
24.....	4.80	253	4.47	127	4.40	106	4.35	95	4.18	66	4.00	44
25.....	4.79	250	4.45	120	4.41	109	4.35	95	4.18	66	4.05	50
26.....	4.78	246	4.43	114	4.38	102	4.35	95	4.18	66	4.02	46
27.....	4.85	269	4.43	114	4.38	102	4.35	95	4.18	66	4.03	48
28.....	4.84	266	4.42	112	4.38	102	4.38	102	4.20	69	3.96	40
29.....	5.00	315	4.40	106	4.38	102	4.45	120	4.16	63	4.00	44
30.....	5.00	315	4.38	102	4.38	102	4.45	120	4.13	60	4.00	44
31.....	5.00	315	4.36	97	.....	.....	4.43	114	.....	.....	4.00	44

MONTHLY DISCHARGE of Crowsnest River near Frank, for 1915.

(Drainage area 168 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	84	54	67	0.399	0.46	4,120
February.....	61	46	53	0.315	0.33	2,943
March.....	69	39	52	0.311	0.36	3,197
April.....	345	65	235	1.400	1.56	13,983
May.....	1,232	418	559	3.327	3.83	34,372
June.....	737	345	450	2.679	2.99	26,777
July.....	474	246	332	1.976	2.28	20,414
August.....	315	97	173	1.030	1.19	10,637
September.....	109	86	95	0.565	0.63	5,653
October.....	138	95	104	0.619	0.71	6,395
November.....	114	60	82	0.490	0.55	4,879
December.....	79	33	54	0.324	0.37	3,320
The year.....	.....	.....	.....	.....	15.26	136,690

## CROWSNEST RIVER NEAR LUNDBRECK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 26, Tp. 7, Rge. 2, W. 5th Mer., at the traffic bridge just north of Lundbreck.

*Records available.*—September 7, 1907, to December 31, 1915.

*Gauge.*—Chain, on downstream side of the traffic bridge about 75 feet upstream from the old staff gauge. Elevation at zero of staff gauge maintained at 91.82 feet during 1912-13. Elevation at zero of chain gauge maintained at 90.86 feet during 1914-15.

*Bench-mark.*—Permanent bench-mark cut in the left wing-wall on the downstream side. Assumed elevation 100.00 feet.

*Channel.*—Rocky formation and fairly permanent.

*Discharge measurements.*—Made from the traffic bridge.

*Winter flow.*—Records are obtained throughout the frozen period.

*Observer.*—Ed. Marlow.

## DISCHARGE MEASUREMENTS of Crowsnest River near Lundbreck, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 9.....	F. R. Steinberger.....	61	72	1.14	3.52	82
Feb. 26.....	do.....	63	73	0.94	3.43	68
Mar. 11.....	P. H. Daniells.....	52	65	1.12	1.71	73
Mar. 30.....	do.....	54	64	1.62	1.84	104
April 9.....	do.....	57	92	2.26	2.28	208
April 22.....	do.....	64	122	3.11	2.82	379
May 10.....	W. R. McCaffrey.....	70	192	4.70	3.80	902
May 21.....	G. H. Whyte and W. R. McCaffrey.....	68	207	4.28	3.66	886
June 4.....	W. R. McCaffrey.....	67	159	3.46	3.10	551
June 18.....	do.....	68	179	3.57	3.49	639
July 7.....	do.....	67	157	4.04	3.27	635
July 20.....	do.....	63	130	3.06	2.73	399
July 31.....	do.....	63	125	3.14	2.75	394
Aug. 19.....	do.....	60	104	2.32	2.32	242
Sept. 13.....	do.....	57	87	2.00	2.06	174
Sept. 29.....	do.....	59	86	2.14	2.12	175
Oct. 15.....	do.....	58	88	2.06	2.08	181
Nov. 2.....	do.....	56	84	1.98	2.13	166
Nov. 16.....	do.....	56	87	1.67	2.26	146
Nov. 30.....	do.....	57	85	1.12	2.40	94
Dec. 14.....	do.....	57	81	1.14	2.21	92
Dec. 31.....	do.....	42	55	0.94	2.53	52

SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE OF Crowsnest River near Lundbreck, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.10	148	3.40	101	3.45	68	1.86	104	3.50	734	3.18	552
2.....	3.08	147	3.55	98	3.20	68	2.05	149	4.55	1,467	3.23	578
3.....	3.10	144	3.60	96	3.55	69	2.50	279	4.00	1,082	3.23	578
4.....	3.06	140	3.50	94	3.45	70	2.45	262	3.90	1,012	3.11	518
5.....	2.95	138	3.45	91	3.40	72	2.35	231	3.75	907	3.13	527
6.....	2.80	140	3.50	89	3.50	76	2.35	231	3.55	768	3.12	523
7.....	3.57	142	3.50	86	2.65	120	2.30	216	3.55	768	3.07	499
8.....	3.60	145	3.50	84	2.05	140	2.30	216	3.70	872	3.02	477
9.....	3.50	147	3.55	82	1.70	75	2.25	202	3.65	837	2.97	455
10.....	3.45	149	3.55	81	1.70	75	2.40	246	3.80	942	3.02	477
11.....	3.50	150	3.45	80	1.70	75	2.45	262	3.67	851	3.02	477
12.....	3.40	150	3.50	78	1.70	75	2.50	279	3.47	715	3.02	477
13.....	3.45	150	3.50	76	1.75	83	2.65	330	4.09	1,145	3.02	477
14.....	3.30	147	3.30	74	1.75	83	2.75	366	4.39	1,355	3.17	547
15.....	3.20	128	3.25	73	1.80	92	2.70	348	3.64	830	3.27	598
16.....	3.20	130	3.85	73	1.85	102	2.78	377	3.64	830	3.32	625
17.....	3.30	134	3.55	75	1.80	92	2.85	405	3.54	761	3.27	598
18.....	3.05	137	3.55	74	1.80	92	2.90	425	4.09	1,145	3.47	715
19.....	3.25	136	3.50	71	1.75	83	2.95	446	3.94	1,040	3.59	795
20.....	3.45	130	3.50	69	1.80	92	2.89	421	3.74	900	3.42	684
21.....	3.35	120	3.54	70	1.85	102	2.85	405	3.67	851	3.27	598
22.....	2.90	116	3.90	73	1.90	113	2.80	385	3.54	761	3.25	588
23.....	3.30	117	3.60	72	1.95	124	2.70	348	3.53	754	3.22	572
24.....	3.40	116	3.40	70	1.95	124	2.65	330	3.55	768	3.17	547
25.....	3.30	113	3.45	69	1.80	92	2.63	323	3.57	782	3.22	572
26.....	3.30	106	3.45	68	1.90	113	2.60	313	3.54	761	3.72	886
27.....	3.28	106	3.60	67	1.90	113	2.55	296	3.33	631	3.62	816
28.....	3.25	107	3.45	67	1.94	122	2.55	296	3.33	631	3.53	754
29.....	3.60	106	.....	.....	1.95	124	2.68	341	3.33	631	3.48	721
30.....	3.50	106	.....	.....	1.84	100	2.75	366	3.23	578	3.53	754
31.....	3.50	104	.....	.....	1.85	102	.....	.....	3.23	578	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest River near Lundbreck, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.48	721	2.90	425	2.12	167	2.13	170	2.13	170	2.33	95
2.....	3.53	754	2.78	377	2.15	175	2.08	157	2.13	170	2.73	96
3.....	3.36	648	2.70	348	2.15	175	2.20	188	2.08	157	2.73	100
4.....	3.43	690	2.68	341	2.15	175	2.18	183	2.08	157	2.28	104
5.....	3.18	552	2.60	313	2.10	162	2.18	183	2.08	157	2.38	105
6.....	3.23	578	2.60	313	2.10	162	2.13	170	2.06	152	1.93	106
7.....	3.28	604	2.55	296	2.10	162	2.13	170	2.03	144	1.88	106
8.....	3.19	557	2.60	313	2.10	162	2.13	170	2.03	144	1.88	106
9.....	3.14	532	2.50	279	2.10	162	2.13	170	2.03	144	1.93	105
10.....	3.09	508	2.45	262	2.12	167	2.13	170	2.06	152	1.98	89
11.....	3.04	486	2.45	262	2.09	159	2.10	162	2.08	157	2.10	91
12.....	2.94	442	2.40	246	2.09	159	2.08	157	2.08	160	2.13	97
13.....	2.89	421	2.38	240	2.07	154	2.08	157	2.18	157	2.03	95
14.....	2.84	401	2.38	240	2.04	146	2.08	157	2.18	153	2.21	92
15.....	2.84	401	2.35	231	2.04	146	2.08	157	2.23	149	2.53	92
16.....	2.79	381	2.32	222	2.04	146	2.04	146	2.26	146	2.28	92
17.....	2.87	413	2.30	216	2.04	146	2.04	146	2.46	141	2.93	102
18.....	2.79	381	2.35	231	2.04	146	2.03	144	2.30	138	2.93	103
19.....	2.77	374	2.35	231	2.04	146	2.08	157	1.98	136	3.25	104
20.....	2.76	370	2.35	231	2.09	159	2.08	157	2.04	131	3.43	105
21.....	2.75	366	2.32	222	2.09	159	2.08	157	1.96	126	3.48	106
22.....	2.70	348	2.30	216	2.07	154	2.06	152	2.15	120	3.33	105
23.....	2.70	348	2.30	216	2.07	154	2.05	149	1.96	117	3.13	94
24.....	2.65	330	2.25	202	2.17	180	2.04	146	1.88	114	3.02	84
25.....	2.65	330	2.25	202	2.19	185	2.03	144	2.13	110	2.72	74
26.....	2.70	348	2.25	202	2.14	172	2.03	144	1.98	103	2.72	73
27.....	2.75	366	2.22	194	2.09	159	2.04	146	2.33	97	2.72	76
28.....	2.75	366	2.18	183	2.10	162	2.04	146	2.16	93	2.88	78
29.....	2.85	405	2.17	180	2.10	162	2.13	170	2.48	93	2.63	68
30.....	2.85	405	2.15	175	2.08	157	2.13	170	2.40	94	2.58	55
31.....	2.78	377	2.15	175	.....	.....	2.13	170	.....	.....	2.53	52

## MONTHLY DISCHARGE of Crowsnest River near Lundbreck, for 1915.

(Drainage area 276 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	150	104	131	0.475	0.55	8,055
February.....	101	67	79	0.286	0.30	4,387
March.....	124	68	95	0.344	0.40	5,841
April.....	446	104	307	1.112	1.24	18,268
May.....	1,467	578	861	3.120	3.60	52,941
June.....	886	455	600	2.174	2.43	35,702
July.....	754	330	458	1.660	1.91	28,161
August.....	425	175	251	0.903	1.04	15,433
September.....	185	146	161	0.583	0.65	9,580
October.....	188	144	160	0.580	0.67	9,838
November.....	170	93	136	0.492	0.55	8,093
December.....	106	52	92	0.333	0.38	5,657
The year.....					13.72	201,956

SESSIONAL PAPER No. 25c

CONNELLY CREEK NEAR LUNDBRECK.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 36, Tp. 7, Rge. 2, W. 5th Mer.

*Records.*—Discharge measurements only are available from August 20, 1908, to December 31, 1915.

*Gauge.*—Vertical staff, nailed to a tree on the left bank.

*Bench-mark.*—On the head of a bolt driven vertically in a notch cut in a leaning tree, on the left bank. Elevation 3.93 feet above the zero of the gauge.

*Discharge measurements.*—Made by wading in high water and by means of an 18-inch weir in low stages.

*Winter flow.*—Discharge measurements are not made during the winter season.

*Observer.*—Gauge height records are available from August 1 to October 31, 1909; since then there has been no observer at this station.

DISCHARGE MEASUREMENTS of Connelly Creek near Lundbreck, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 30.....	P. H. Daniells.....	11.0	5.8	0.68	2.64	4.0
April 9.....	do.....	11.0	5.8	0.82	2.40	4.7
April 22.....	do.....	11.5	5.8	0.68	2.38	4.0
May 10.....	W. R. McCaffrey.....	12.0	8.2	1.48	2.52	12.2
May 21.....	G. H. Whyte and W. R. McCaffrey.....	12.0	10.2	2.78	2.74	28.0
June 4.....	W. R. McCaffrey.....	11.0	9.3	1.57	2.58	14.6
June 18.....	do.....	13.5	10.4	3.22	2.79	34.0
July 7.....	do.....	13.0	12.0	2.09	2.94	25.0
July 20.....	do.....	12.0	8.0	1.33	2.66	10.6
July 31.....	do.....	12.5	9.4	1.24	2.65	11.7
Aug. 19.....	do.....	12.0	7.2	0.66	2.48	4.7
Sept. 13.....	do.....	11.5	6.7	0.55	2.42	3.7
Sept. 29.....	do.....	12.5	6.0	0.53	2.45	3.2
Oct. 15.....	do.....	11.5	6.4	0.59	2.46	3.8

COW CREEK NEAR COWLEY.

*Location.*—On NE.  $\frac{1}{4}$  Sec. 14, Tp. 8, Rge. 2, W. 5th Mer., at John Ross' ranch, five miles north of Lundbreck Station.

*Records available.*—August 20, 1908, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 94.53 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Clay and rocks, fairly permanent.

*Discharge measurements.*—Made from a foot-bridge during high water and by wading in low stages.

*Winter flow.*—Discharge measurements are not made during the winter season.

*Observer.*—Wm. Mackay.

## DISCHARGE MEASUREMENTS of Cow Creek near Cowley, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 30.....	P. H. Daniells.....	8.5	6.80	0.87	1.98	5.9
April 9.....	do.....	9.0	7.70	1.00	2.05	7.6
April 22.....	do.....	8.5	8.00	0.88	2.04	7.0
May 10.....	W. R. McCaffrey.....	9.0	11.80	1.64	2.47	19.4
May 21.....	do.....	9.5	16.80	2.14	2.96	36.0
June 4.....	do.....	8.5	12.30	1.62	2.47	19.8
June 18.....	do.....	10.0	16.40	2.38	3.03	39.0
July 7.....	do.....	10.0	17.30	2.46	3.01	42.0
July 20.....	do.....	8.5	10.80	1.22	2.26	13.2
July 31.....	do.....	9.5	11.00	1.02	2.17	11.3
Aug. 19.....	do.....	9.0	8.20	0.64	1.91	5.3
Sept. 13.....	do.....	9.0	7.00	0.55	1.84	3.9
Sept. 29.....	do.....	9.0	6.70	0.56	1.83	3.8
Oct. 15.....	do.....	9.0	7.10	0.61	1.90	4.7

## DAILY GAUGE HEIGHT AND DISCHARGE of Cow Creek near Cowley, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.40	16.8	3.17	45.0	2.45	18.4
2.....			2.51	20.0	3.34	52.0	2.50	20.0
3.....			2.52	21.0	2.81	31.0	2.06	7.8
4.....			2.25	12.3	2.50	20.0	2.46	18.7
5.....			2.14	9.6	3.15	44.0	2.70	27.0
6.....			2.10	8.7	2.50	20.0	2.49	19.7
7.....			2.08	8.5	2.48	19.4	2.51	20.0
8.....			2.06	7.8	2.48	19.4	2.46	18.7
9.....			2.10	8.7	2.44	18.1	2.32	14.3
10.....			2.00	6.6	2.44	18.1	2.37	15.8
11.....			2.01	6.8	2.42	17.4	2.38	16.2
12.....			2.01	6.8	2.38	16.2	2.79	30.0
13.....			2.05	7.6	2.43	17.8	2.59	23.0
14.....	2.55	22.0	2.10	8.7	3.19	46.0	3.00	38.0
15.....	2.50	20.0	2.11	8.9	2.96	37.0	3.53	59.0
16.....	2.69	27.0	2.08	8.3	2.81	31.0	3.18	45.0
17.....	2.78	30.0	2.06	7.8	3.01	39.0	3.60	62.0
18.....	2.55	22.0	2.06	7.8	4.22	87.0	3.06	41.0
19.....	2.41	17.1	2.05	7.6	3.50	58.0	4.74	108.0
20.....	2.45	18.4	2.05	7.6	3.10	42.0	3.05	40.0
21.....	2.31	14.0	2.05	7.6	3.00	38.0	2.76	30.0
22.....	2.35	15.2	2.04	7.4	2.97	37.0	2.70	27.0
23.....	2.40	16.8	2.03	7.2	2.81	31.0	2.65	25.0
24.....	2.21	11.3	2.03	7.2	2.70	27.0	2.59	23.0
25.....	2.17	10.0	2.03	7.2	2.76	29.0	3.66	65.0
26.....	1.94	5.5	2.03	7.2	2.68	26.0	5.24	128.0
27.....	1.90	4.8	2.02	7.0	2.60	23.0	3.52	59.0
28.....	1.99	6.4	2.01	6.8	2.60	23.0	3.09	42.0
29.....	2.05	7.6	2.01	6.8	2.57	22.0	2.91	35.0
30.....	1.95	5.7	2.08	8.3	2.52	21.0	2.96	37.0
31.....	2.10	8.7			2.46	18.7		

DAILY GAUGE HEIGHT AND DISCHARGE OF Cow Creek near Cowley, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.20	46.0	2.32	14.3	1.75	2.8	1.80	3.4
2.....	2.97	37.0	2.86	33.0	1.75	2.8	1.87	4.4
3.....	3.50	58.0	2.19	10.8	1.76	2.9	2.02	7.0
4.....	2.98	37.0	2.09	8.5	1.76	2.9	1.91	5.0
5.....	2.90	34.0	2.01	6.8	1.75	2.8	1.80	3.4
6.....	2.83	32.0	2.00	6.6	1.75	2.8	1.86	4.2
7.....	3.01	39.0	1.95	5.7	1.77	3.0	1.91	5.0
8.....	2.68	26.0	1.98	6.2	1.77	3.0	1.88	4.5
9.....	2.56	22.0	1.95	5.7	1.79	3.3	1.84	4.0
10.....	2.52	21.0	1.86	4.2	1.82	3.7	1.84	4.0
11.....	2.48	19.4	1.89	4.7	1.82	3.7	1.95	5.7
12.....	2.39	16.5	1.84	4.0	1.80	3.4	1.95	5.7
13.....	2.35	15.2	1.86	4.2	1.80	3.4	1.90	4.8
14.....	2.39	16.5	1.86	4.2	1.81	3.5	1.93	5.3
15.....	2.35	15.2	1.85	4.1	1.81	3.5	1.90	4.8
16.....	2.31	14.0	1.85	4.1	1.78	3.2	1.87	4.4
17.....	2.30	13.7	1.85	4.1	1.76	2.9	1.85	4.1
18.....	2.41	17.1	2.05	7.6	1.75	2.8	1.82	3.7
19.....	2.31	14.0	1.88	4.5	1.75	2.8	1.89	4.7
20.....	2.26	12.6	2.00	6.6	1.77	3.0	1.90	4.8
21.....	2.21	11.3	1.96	5.9	1.75	2.8	1.85	4.1
22.....	2.19	10.8	1.91	5.0	1.75	2.8	1.80	3.4
23.....	2.12	9.1	1.91	5.0	1.77	3.0	1.78	3.2
24.....	2.12	9.1	1.87	4.4	2.11	8.9	1.78	3.2
25.....	2.11	8.9	1.85	4.1	1.97	6.1	1.79	3.3
26.....	2.31	14.0	1.80	3.4	1.85	4.1	1.80	3.4
27.....	2.26	12.6	1.75	2.8	1.84	4.0	1.82	3.7
28.....	2.47	19.0	1.79	3.3	1.84	4.0	1.81	3.5
29.....	2.42	17.4	1.77	3.0	1.83	3.8	1.90	4.8
30.....	2.32	14.3	1.76	2.9	1.83	3.8	1.85	4.1
31.....	2.18	10.5	1.75	2.8	.....	.....	1.83	3.8

MONTHLY DISCHARGE of Cow Creek near Cowley, for 1915.

(Drainage area 29 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March(14-31).....	30.0	4.8	14.6	0.503	0.34	521
April.....	21.0	6.6	9.0	0.311	0.35	536
May.....	87.0	16.2	31.0	1.069	1.23	1,906
June.....	128.0	7.8	37.0	1.276	1.42	2,202
July.....	46.0	8.9	21.0	0.724	0.83	1,291
August.....	35.0	2.8	6.2	0.214	0.25	381
September.....	8.9	2.8	3.5	0.124	0.14	208
October.....	7.0	3.2	4.3	0.148	0.17	264
The period.....	.....	.....	.....	.....	4.73	7,309



## HUFF DITCH NEAR COWLEY.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 31, Tp. 8, Rge. 1, W. 5th Mer.

*Records available.*—May 10, 1915, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation, maintained at 95.41 feet since establishment.

*Bench-mark.*—Nail on post 175 feet west of gauge rod. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made by wading with meter or with weir.

*Observer.*—W. H. Connor.

## DISCHARGE MEASUREMENTS of Huff Ditch near Cowley, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 4.....	W. R. McCaffrey.....	2.0	1.0	1.32	1.85	1.32
July 31.....	do .....					Nil.

## DAILY GAUGE HEIGHT AND DISCHARGE of Huff Ditch near Cowley, for 1915.

DAY.	May.	
	Gauge Height	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.32	0.18
2.....	Dry.	Nil.
3.....	"	"
4.....	"	"
5.....	"	"
6.....	"	"
7.....	"	"
8.....	"	"
9.....	"	"
10.....	"	"
11.....	"	"
12.....	"	"
13.....	1.20	0.09
14.....	1.20	0.09
15.....	1.30	0.16
16.....	Dry.	Nil.
17.....	"	"
18.....	"	"
19.....	"	"
20.....	"	"
21.....	"	"
22.....	"	"
23.....	"	"
24.....	"	"
25.....	"	"
26.....	1.20	0.09
27.....	1.19	0.09
28.....	1.20	0.09
29.....	1.19	0.09
30.....	Dry.	Nil.
31.....	"	"

No water used after May 29.

SESSIONAL PAPER No. 25c

MONTHLY DISCHARGE of Huff Ditch near Cowley, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May.....	0.18	0.00	0.03	1.8
The period.....				1.8

No water used after May 29.

ELTON DITCH FROM TODD CREEK.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 19, Tp. 8, Rge. 1, W. 5th Mer., on Elton's ranch seven miles north of Cowley.

*Records available.*—June 6, 1914, to October 31, 1915.

*Gauge.*—Vertical staff.

*Bench-mark.*—Two spikes in a post 150 feet south of the gauge. Elevation, 1.66 feet above the zero of the gauge.

*Channel.*—Clay and fairly permanent.

*Discharge measurements.*—Made by wading.

*Observer.*—Cecil Elton.

DISCHARGE MEASUREMENTS of Elton Ditch from Todd Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft</i>
June 4.....	W. R. McCaffrey.....	2.5	1.85	1.34	2.37	2.5

## DAILY GAUGE HEIGHT AND DISCHARGE of Elton Ditch from Todd Creek, for 1915.

DAY.	June.	
	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.
1.....	Dry.	Nil.
2.....	"	"
3.....	"	"
4.....	2.45	2.80
5.....	2.29	2.20
6.....	2.28	2.20
7.....	2.40	2.60
8.....	2.39	2.60
9.....	2.35	2.40
10.....	2.38	2.50
11.....	1.29	0.04
12.....	1.25	0.02
13.....	Dry.	Nil.
14.....	"	"
15.....	"	"
16.....	"	"
17.....	"	"
18.....	"	"
19.....	"	"
20.....	1.92	1.04
21.....	Dry.	Nil.
22.....	"	"
23.....	1.73	0.63
24.....	Dry.	Nil.
25.....	"	"
26.....	"	"
27.....	"	"
28.....	"	"
29.....	"	"
30.....	"	"
31.....	"	"

No water used after June 23.

## MONTHLY DISCHARGE of Elton Ditch from Todd Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
June.....	2.80	Nil.	0.63	37
The period.....				37

NOTE.—No water used after June 23.

## TODD CREEK AT ELTON'S RANCH.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 19, Tp. 8, Rge. 1, W. 5th Mer., near Cecil Elton's house, seven miles north of Cowley.

*Records available.*—August 20, 1908, to October 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero maintained at 93.30 feet during 1909-11. Elevation of zero maintained at 93.02 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Sand and gravel; quite permanent.

*Discharge measurements.*—Are made from a foot-bridge during high water, and by wading during low stages.

*Winter flow.*—No discharge measurements are made during the winter season.

*Observer.*—C. W. S. Elton.

SESSIONAL PAPER No. 25c

DISCHARGE MEASUREMENTS of Todd Creek at Elton's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 30.....	P. H. Daniells.....	7.5	9.2	1.28	3.85a	12.0
April 9.....	do.....	20.0	20.0	0.73	2.83	14.8
April 22.....	do.....	20.0	17.6	0.88	2.85	15.4
May 10.....	W. R. McCaffrey.....	20.0	25.0	1.53	3.19	39.0
May 21.....	G. H. Whyte and W. R. McCaffrey.....	20.0	36.0	2.25	3.67	81.0
June 4.....	W. R. McCaffrey.....	20.0	30.0	1.68	3.34	51.0
June 18.....	do.....	21.0	37.0	2.26	3.67	84.0
July 7.....	do.....	20.0	40.0	2.20	3.76	89.0
July 20.....	do.....	20.0	29.0	1.36	3.29	40.0
July 31.....	do.....	20.0	27.0	1.21	3.10	33.0
Aug. 19.....	do.....	20.0	21.0	0.70	2.81	14.4
Sept. 13.....	do.....	20.0	19.4	0.52	2.71	10.0
Sept. 29.....	do.....	20.0	19.8	0.61	2.75	12.1
Oct. 15.....	do.....	20.0	22.0	0.61	2.89	13.1

a Ice at gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Todd Creek at Elton's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			4.31	60.0	3.23	39	3.35	49
2.....			4.06	50.0	3.78	93	3.35	49
3.....			3.70	35.0	3.90	107	3.41	54
4.....			3.28	35.0	3.65	79	3.37	51
5.....			3.08	25.0a	3.40	53	3.37	51
6.....			3.03	25.0	3.36	50	3.41	54
7.....			2.96	21.0	3.28	43	3.33	47
8.....			2.90	18.0	3.26	41	3.33	47
9.....			2.91	18.5	3.23	39	3.29	44
10.....			2.82	14.5	3.18	35	3.32	46
11.....			2.82	14.5	3.18	35	3.27	42
12.....			2.84	15.3	3.16	34	3.39	52
13.....			2.84	15.3	3.18	35	3.47	60
14.....			2.86	16.2	3.55	68	3.54	67
15.....			2.86	16.2	3.63	77	3.71	85
16.....	5.77	70a	2.88	17.1	3.47	60	3.83	99
17.....	5.51	64	2.88	17.1	3.53	66	3.69	83
18.....	5.13	60	2.88	17.1	3.91	108	3.67	81
19.....	4.73	54	2.86	16.2	4.25	149	4.53	183
20.....	4.63	59	2.84	15.3	3.91	108	4.31	156
21.....	4.57	70	2.82	14.5	3.76	91	3.79	94
22.....	4.49	80	2.82	14.5	3.62	76	3.60	74
23.....	4.35	75	2.80	13.7	3.56	69	3.55	68
24.....	4.19	70	2.79	13.4	3.54	67	3.49	62
25.....	4.25	70	2.78	13.0	3.56	69	3.58	71
26.....	3.89	55	2.77	12.7	3.53	66	5.27	371
27.....	3.99	62	2.75	12.0	3.44	57	4.63	195
28.....	3.83	60	2.74	11.7	3.43	56	4.09	130
29.....	3.75	58	2.76	12.3	3.43	56	3.83	99
30.....	3.80	55	2.82	14.5	3.39	52	3.72	86
31.....	3.66	50			3.35	49		

a to a Estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Todd Creek at Elton's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.75	90	3.05	26.0	2.66	9.1	2.72	11.0
2.....	3.76	91	3.03	25.0	2.65	8.8	2.75	12.0
3.....	4.66	198	3.02	24.0	2.70	10.4	2.96	21.0
4.....	4.01	120	2.97	21.0	2.68	9.8	2.90	18.0
5.....	3.86	102	2.92	19.0	2.66	9.1	2.84	15.3
6.....	3.75	90	2.92	19.0	2.67	9.4	2.82	14.5
7.....	3.75	90	2.92	19.0	2.66	9.1	2.80	13.7
8.....	3.59	73	2.91	18.5	2.68	9.8	2.76	12.3
9.....	3.52	65	2.85	15.7	2.71	10.7	2.75	12.0
10.....	3.45	58	2.82	14.5	2.75	12.0	2.75	12.0
11.....	3.39	52	2.81	14.1	2.75	12.0	2.76	12.3
12.....	3.31	45	2.80	13.7	2.74	11.7	2.75	12.0
13.....	3.29	44	2.81	14.1	2.72	11.0	2.80	13.7
14.....	3.30	45	3.23	39.0	2.70	10.4	2.78	13.0
15.....	3.27	42	2.82	14.5	2.70	10.4	2.86	16.2
16.....	3.24	40	2.80	13.7	2.70	10.4	2.79	13.4
17.....	3.23	39	2.79	13.4	2.70	10.4	2.75	12.0
18.....	3.27	42	2.82	14.5	2.70	10.4	2.74	11.7
19.....	3.24	40	2.77	12.7	2.72	11.0	2.74	11.7
20.....	3.23	39	2.84	15.3	2.76	12.3	2.80	13.7
21.....	3.14	32	2.86	16.2	2.76	12.3	2.78	13.0
22.....	3.13	32	2.83	14.9	2.74	11.7	2.74	11.7
23.....	3.06	27	2.82	14.5	2.74	11.7	2.73	11.4
24.....	3.04	25	2.80	13.7	2.82	14.5	2.71	10.7
25.....	3.04	25	2.80	13.7	2.88	17.1	2.72	11.0
26.....	3.14	32	2.78	13.0	2.76	12.3	2.70	10.4
27.....	3.14	32	2.76	12.3	2.76	12.3	2.69	10.1
28.....	3.22	38	2.74	11.7	2.74	11.7	2.70	10.4
29.....	3.25	40	2.71	10.7	2.72	11.0	2.70	10.4
30.....	3.20	37	2.70	12.0	2.71	10.7	2.74	11.7
31.....	3.13	32	2.67	9.4			2.74	11.7

## MONTHLY DISCHARGE of Todd Creek at Elton's Ranch, for 1915.

(Drainage area 57 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (16-31).....	80.0	50.0	63.0	1.105	0.66	1,999
April.....	60.0	11.7	19.8	0.347	0.39	1,178
May.....	149.0	34.0	65.0	1.140	1.31	3,997
June.....	271.0	42.0	85.0	1.491	1.67	5,058
July.....	198.0	25.0	57.0	1.000	1.15	3,505
August.....	39.0	9.4	16.4	0.288	0.33	1,008
September.....	17.1	8.8	11.1	0.195	0.22	660
October.....	21.0	10.1	12.7	0.223	0.26	781
The period.....					5.99	18,186

## OLDMAN RIVER NEAR COWLEY.

*Location.*—On the NE.  $\frac{1}{4}$  of Sec. 34, Tp. 7, Rge. 1, W. 5th Mer.*Records available.*—June 17, 1908, to December 31, 1915. One discharge measurement in 1907.*Gauge.*—Vertical staff. Elevation of zero maintained at 92.08 feet since establishment.*Bench-mark.*—Permanent iron bench-mark on right bank. Assumed elevation, 100.00 feet.*Channel.*—Rock and gravel.*Discharge measurements.*—Made by means of cable and car; at low water by wading.*Observer.*—Archie McKay.

DISCHARGE MEASUREMENTS of Oldman River near Cowley, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 5.	F. R. Steinberger.	93	77	1.37	2.90	105
Feb. 25.	do	85	43	1.29	1.67	56
Mar. 13.	P. H. Daniells.	98	57	1.09	1.30	62
Mar. 20.	do	112	114	1.09	2.90	124
April 9.	do	180	184	1.86	1.87	344
April 22.	do	190	268	2.88	2.52	770
May 10.	W. R. McCaffrey.	200	519	5.33	3.87	2,767
May 22.	do	200	431	4.51	3.38	1,944
June 4.	do	200	432	4.19	3.28	1,812
June 18.	do	200	562	5.22	3.98	2,935
June 28.	do	205	641	5.81	4.30	3,723
July 8.	do	199	409	4.36	3.29	1,783
July 20.	do	191	313	3.11	2.69	983
Aug. 7.	do	190	313	2.88	2.57	903
Aug. 19.	do	186	245	2.48	2.32	608
Sept. 13.	do	178	186	1.99	2.02	371
Sept. 28.	do	179	184	1.95	2.04	359
Oct. 20.	do	183	216	2.20	2.18	474
Nov. 2.	do	177	202	2.21	2.14	426
Nov. 16.	do	187	210	1.70	2.31	357
Dec. 1.	do	160	143	1.33	1.33	190
Dec. 14.	do	100	112	1.25	1.65	140
Dec. 30.	do	110	124	0.91	2.97	113

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman River near Cowley, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	3.43	180	1.97	101	2.90	55	2.13	207	3.01	1,379	3.27	1,765
2.	3.43	184	2.17	101	2.50	62	2.30	223	3.83	2,694	3.42	2,003
3.	3.52	187	2.17	101	2.60	70	3.00	240	3.73	2,516	3.40	1,970
4.	3.42	191	1.97	103	2.75	77	2.91	257	3.41	1,986	3.52	2,163
5.	3.42	195	1.20	105	2.90	80	2.01	275	3.61	2,312	3.50	2,130
6.	3.33	197	1.20	106	2.80	78	2.02	295	3.51	2,146	3.51	2,146
7.	3.42	200	1.60	109	2.60	71	1.95	315	3.63	2,346	3.27	1,765
8.	3.52	202	1.80	114	2.40	60	1.87	332	3.96	2,928	3.22	1,690
9.	3.52	203	1.80	120	2.70	54	1.86	344	3.99	2,992	3.16	1,600
10.	3.42	203	2.90	126	2.60	52	1.96	345	3.93	2,874	3.07	1,465
11.	3.23	203	3.00	134	2.60	54	1.92	325	3.63	2,346	3.00	1,365
12.	3.23	203	3.20	140	2.90	59	2.11	428	3.46	2,066	3.00	1,365
13.	2.43	202	3.50	144	2.90	62	2.23	506	3.39	1,954	3.36	1,906
14.	2.33	201	3.30	146	2.90	71	2.36	609	3.81	2,658	3.47	2,082
15.	3.23	200	3.20	147	3.00	82	2.36	609	3.89	2,802	3.67	2,414
16.	3.15	198	3.10	147	3.00	90	2.38	627	3.51	2,146	3.74	2,533
17.	3.15	196	3.20	145	3.20	99	2.44	685	3.56	2,227	3.87	2,766
18.	2.40	194	3.10	142	3.20	104	2.57	822	3.76	2,568	4.00	3,010
19.	2.50	189	2.90	130	2.90	113	2.59	844	3.49	2,114	4.14	3,390
20.	3.11	182	2.80	112	3.00	124	2.60	855	3.56	2,227	4.07	3,150
21.	3.15	174	2.80	90	2.90	136	2.56	811	3.46	2,066	4.00	3,010
22.	1.95	165	2.90	66	2.91	150	2.29	552	3.43	2,018	3.92	2,856
23.	1.95	155	3.00	57	2.71	156	2.22	499	3.43	2,018	3.94	2,892
24.	1.95	144	2.60	55	2.62	159	2.30	485	3.56	2,227	3.54	2,194
25.	1.95	133	2.45	56	2.22	156	2.22	499	3.66	2,397	3.64	2,863
26.	1.95	124	2.40	55	2.22	140	2.26	528	3.71	2,482	4.40	3,810
27.	2.15	116	2.90	54	2.33	141	2.29	552	3.61	2,312	4.67	4,350
28.	1.75	108	2.50	53	2.13	150	2.31	568	3.56	2,227	4.34	3,690
29.	2.15	104			2.04	162	2.29	552	3.67	2,414	3.92	2,856
30.	2.75	102			2.04	177	2.40	645	3.50	2,130	3.94	2,892
31.	2.15	101			2.10	191			3.36	1,906		

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman River near Cowley, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1. ....	3.81	2,658	3.03	1,407	2.11	426	2.05	390	2.14	444	1.90	190
2. ....	3.68	2,431	3.00	1,365	2.08	408	2.15	450	2.13	438	1.92	194
3. ....	3.63	2,346	2.85	1,160	2.11	426	2.20	485	2.12	432	2.00	196
4. ....	3.51	2,146	2.78	1,069	2.10	420	2.17	464	2.13	438	1.90	195
5. ....	3.43	2,018	2.68	946	2.07	402	2.13	438	2.15	450	1.85	180
6. ....	3.33	1,858	2.63	888	2.03	380	2.11	426	2.17	464	1.80	170
7. ....	3.32	1,842	2.57	822	2.05	390	2.07	402	2.13	355	1.70	164
8. ....	3.25	1,735	2.53	778	2.03	380	2.05	390	2.09	342	1.85	160
9. ....	3.21	1,675	2.43	675	2.07	402	2.03	380	1.98	332	1.80	150
10. ....	3.13	1,555	2.39	636	2.13	438	2.10	420	1.98	316	1.60	140
11. ....	3.01	1,379	2.38	627	2.14	444	2.07	402	2.03	306	1.65	134
12. ....	2.91	1,239	2.83	1,134	2.22	499	2.04	385	2.00	300	1.60	133
13. ....	2.83	1,134	2.33	584	2.10	420	2.03	380	1.93	296	1.65	134
14. ....	2.95	1,295	2.32	576	2.03	380	2.03	380	1.93	300	1.64	140
15. ....	2.85	1,160	2.34	592	2.05	390	2.01	370	2.23	328	1.90	147
16. ....	2.75	1,030	2.39	636	2.07	402	2.03	380	2.40	357	2.00	150
17. ....	2.71	982	2.35	600	2.02	375	2.02	375	2.39	354	2.05	153
18. ....	2.65	910	2.37	618	2.00	365	2.04	385	2.25	343	2.00	153
19. ....	2.73	1,006	2.31	568	1.99	360	2.00	365	2.21	330	2.10	150
20. ....	2.69	958	2.33	584	2.03	380	2.08	408	2.12	319	2.20	148
21. ....	2.63	888	2.27	536	2.01	370	2.08	408	2.03	313	2.30	146
22. ....	2.63	888	2.27	536	2.03	380	2.07	402	1.93	303	2.40	145
23. ....	2.58	833	2.28	544	2.11	426	2.03	380	2.13	287	2.60	141
24. ....	2.55	800	2.21	492	2.13	438	2.02	375	2.23	273	2.70	140
25. ....	2.51	756	2.20	485	2.14	444	2.03	380	2.13	262	2.70	137
26. ....	2.52	767	2.13	438	2.03	380	2.07	402	2.18	236	2.75	134
27. ....	2.55	800	2.17	464	2.05	390	2.09	414	1.93	200	2.80	130
28. ....	2.67	934	2.13	438	2.03	380	2.12	432	1.93	183	2.85	127
29. ....	2.81	1,108	2.11	426	2.02	375	2.13	438	1.93	180	2.80	120
30. ....	2.85	1,160	2.11	426	2.01	370	2.14	444	1.83	185	2.92	113
31. ....	2.93	1,267	2.11	426	.....	.....	2.17	464	.....	.....	2.90	110

## MONTHLY DISCHARGE of Oldman River near Cowley, for 1915.

(Drainage area 800 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January. ....	203	101	172	0.215	0.25	10,576
February. ....	147	53	106	0.132	0.14	5,887
March. ....	191	52	105	0.131	0.15	6,456
April. ....	855	207	494	0.618	0.69	29,395
May. ....	2,992	1,379	2,306	2.882	3.32	141,790
June. ....	4,350	1,365	2,450	3.100	3.46	145,790
July. ....	2,658	756	1,341	1.676	1.93	82,455
August. ....	1,407	426	693	0.866	1.00	42,611
September. ....	499	360	401	0.501	0.56	23,861
October. ....	485	365	407	0.509	0.59	25,025
November. ....	464	180	322	0.402	0.45	19,160
December. ....	196	110	149	0.186	0.21	9,162
The year. ....	.....	.....	.....	.....	12.75	542,168

## CANYON CREEK NEAR MOUNTAIN MILL.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 14, Tp. 6, Rgc. 2, W. 5th Mer.*Records available.*—April 10, 1911, to October 31, 1915. Discharge measurements only in 1910.*Gauge.*—Vertical staff.*Bench-mark.*—Spike in tree on left bank. Elevation, 14.49 feet above zero of gauge.



SESSIONAL PAPER No. 25c

Channel.—Clean gravel and rock.

Discharge measurements.—During high stages made at traffic bridge one-half mile upstream; at ordinary stages by wading below the gauge.

Winter flow.—Station not maintained during the winter.

Observer.—G. Biron.

DISCHARGE MEASUREMENTS of Canyon Creek near Mountain Mill, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 26.....	P. H. Daniels.....	7.0	5.4	1.37	4.70	7.4
April 9.....	do.....	10.0	8.2	2.35	4.67	19.3
April 21.....	do.....	9.0	8.8	2.10	4.71	18.4
May 6.....	do.....	24.0	34.0	3.03	5.55	103.0
May 19.....	W. R. McCaffrey.....	28.0	74.0	2.28	6.07	169.0
June 5.....	do.....	25.0	30.0	3.04	5.41	91.0
June 19.....	do.....	26.0	34.6	3.28	5.56	114.0
July 6.....	do.....	21.0	23.6	1.58	5.00	37.0
July 21.....	do.....	14.0	13.6	1.56	4.74	21.0
Aug. 5.....	do.....	24.0	18.1	1.40	4.68	25.0
Aug. 20.....	do.....	23.0	17.9	1.64	4.81	29.0
Sept. 14.....	do.....	19.0	16.1	0.93	4.34	14.9
Oct. 1.....	do.....	19.0	14.6	0.81	4.49	11.8
Oct. 13.....	do.....	23.0	15.2	1.24	4.59	19.0
Nov. 1.....	do.....	22.5	15.2	1.28	4.57	19.5

DAILY GAUGE HEIGHT AND DISCHARGE of Canyon Creek near Mountain Mill, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			4.40	8.5	5.26	68	4.99	42
2.....			4.55	14.8	5.92	152	5.04	47
3.....			4.84	31.0	5.87	144	5.16	58
4.....			4.75	25.0	5.52	99	5.51	97
5.....			4.68	21.0	5.72	125	5.41	85
6.....			4.67	20.0	5.52	99	5.35	78
7.....			4.68	21.0	5.45	90	5.19	61
8.....			4.67	20.0	5.44	89	5.14	56
9.....			4.64	19.0	5.35	78	5.11	53
10.....			4.63	18.5	5.26	68	5.13	57
11.....			4.63	18.5	5.20	62	5.18	60
12.....			4.64	19.0	5.10	52	5.55	102
13.....			4.67	20.0	5.09	51	5.35	78
14.....			4.76	26.0	5.56	104	5.70	122
15.....	4.28	5.0	4.86	32.0	5.90	149	5.65	116
16.....	4.28	5.0	4.80	28.0	5.78	132	5.55	102
17.....	4.30	5.5	4.77	26.0	5.77	131	5.50	96
18.....	4.39	8.2	4.74	24.0	6.27	202	4.74	127
19.....	4.31	5.8	4.73	24.0	6.17	186	5.56	104
20.....	4.26	4.5	4.72	23.0	5.82	138	5.43	88
21.....	4.30	5.5	4.70	22.0	5.67	118	5.35	78
22.....	4.34	6.7	4.69	22.0	5.57	105	5.29	71
23.....	4.42	9.3	4.67	20.0	5.53	99	5.26	68
24.....	4.35	7.0	4.66	20.0	5.42	86	5.18	60
25.....	4.36	7.3	4.64	19.0	5.39	83	5.15	57
26.....	4.46	10.9	4.63	18.5	5.31	73	5.44	89
27.....	4.46	10.9	4.63	18.5	5.21	63	5.30	73
28.....	4.34	6.7	4.62	18.0	5.16	58	5.18	60
29.....	4.35	7.0	4.61	17.5	5.13	55	5.10	53
30.....	4.32	6.1	4.60	17.0	5.06	48	5.10	53
31.....	4.36	7.3			5.01	44		

DAILY GAUGE HEIGHT AND DISCHARGE OF Canyon Creek near Mountain Mill, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	5.13	55.0	5.04	47.0	4.31	5.8	4.47	11.3
2.....	5.10	52.0	4.89	34.0	4.32	6.1	4.51	13.0
3.....	5.11	53.0	4.81	29.0	4.48	11.7	4.55	14.8
4.....	5.00	43.0	4.75	25.0	4.42	9.3	4.53	13.8
5.....	4.93	37.0	4.70	22.0	4.34	6.7	4.53	13.8
6.....	5.01	44.0	4.66	20.0	4.31	5.8	4.58	16.1
7.....	5.03	46.0	4.64	19.0	4.31	5.8	4.56	15.2
8.....	4.89	34.0	4.63	18.5	4.32	6.1	4.54	14.3
9.....	4.85	32.0	4.52	13.4	4.53	13.8	4.52	13.4
10.....	4.83	30.0	4.52	13.4	4.75	25.0	4.53	13.8
11.....	4.78	27.0	4.52	13.4	4.64	19.0	4.54	14.3
12.....	4.75	25.0	4.51	13.0	4.57	15.7	4.58	16.1
13.....	4.71	23.0	4.51	13.0	4.52	13.4	4.61	17.5
14.....	4.75	25.0	4.52	13.4	4.53	13.8	4.60	17.0
15.....	4.70	22.0	4.49	12.1	4.53	13.8	4.64	19.0
16.....	4.66	20.0	4.51	13.0	4.52	13.4	4.61	17.5
17.....	4.74	24.0	4.47	11.3	4.49	12.1	4.60	17.0
18.....	5.10	52.0	4.48	11.7	4.50	12.5	4.58	16.1
19.....	4.10	1.0	4.47	11.3	4.49	12.1	4.61	17.5
20.....	4.78	27.0	4.82	29.0	4.49	12.1	4.60	17.0
21.....	4.72	23.0	4.70	22.0	4.47	11.3	4.59	16.6
22.....	4.67	20.0	4.57	15.7	4.45	10.5	4.56	15.2
23.....	4.62	18.0	4.56	15.2	4.44	10.1	4.54	14.2
24.....	4.60	17.0	4.51	13.0	4.61	17.5	4.54	14.3
25.....	4.64	19.0	4.48	11.7	4.55	14.8	4.53	13.8
26.....	4.93	37.0	4.44	10.1	4.52	13.4	4.53	13.8
27.....	4.75	25.0	4.41	8.9	4.49	12.1	4.53	13.8
28.....	5.05	48.0	4.35	7.0	4.51	13.0	4.52	13.4
29.....	5.07	49.0	4.36	7.3	4.52	13.4	4.51	13.0
30.....	5.03	46.0	4.36	7.3	4.49	12.1	4.50	12.5
31.....	4.87	33.0	4.31	5.8	.....	.....	4.51	13.0

## MONTHLY DISCHARGE OF Canyon Creek near Mountain Mill, for 1915.

(Drainage area 27 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (15-31).....	10.9	4.5	7.0	0.259	0.16	236
April.....	32.0	8.5	21.0	0.778	0.87	1,250
May.....	202.0	44.0	98.0	3.630	4.18	6,026
June.....	127.0	42.0	76.0	2.815	3.14	4,522
July.....	55.0	1.0	32.0	1.185	1.37	1,968
August.....	47.0	5.8	16.3	0.604	0.70	1,002
September.....	25.0	5.8	12.1	0.448	0.50	720
October.....	19.0	11.3	14.9	0.552	0.64	916
The period.....	.....	.....	.....	.....	11.56	16,640

## MILL CREEK NEAR MOUNTAIN MILL.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 18, Tp. 6, Rge. 1, West of the 5th Meridian.*Records available.*—July 7, 1910, to October 31, 1915.*Gauge.*—Vertical staff. Elevation of zero maintained at 93.41 feet since establishment.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Channel.*—Coarse gravel.*Discharge measurements.*—By wading at ordinary stages and from bridge at flood stages.*Winter flow.*—Station not maintained during the winter.*Observer.*—K. B. Parsons.

SESSIONAL PAPER No. 25c

DISCHARGE MEASUREMENTS of Mill Creek at Mountain Mill, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Mar. 26.....	P. H. Daniels.....	30	30	0.67	1.55	20
April 8.....	do.....	38	34	1.54	1.54	53
April 21.....	do.....	46	53	2.42	2.27	128
May 6.....	do.....	61	92	3.88	2.75	357
May 19.....	W. R. McCaffrey.....	71	117	4.24	2.95	496
June 5.....	do.....	67	132	4.70	3.25	619
June 19.....	do.....	64	126	4.61	2.94	503
July 6.....	do.....	45	55	3.38	2.22	178
July 21.....	do.....	47	55	3.22	2.23	177
Aug. 5.....	do.....	47	56	3.47	2.31	195
Aug. 20.....	do.....	36	38	2.86	1.93	108
Sept. 14.....	do.....	34	31	2.26	1.77	70
Oct. 1.....	do.....	36	41	2.69	1.94	110
Oct. 13.....	do.....	39	39	2.81	1.99	110
Nov. 1.....	do.....	36	36	2.48	1.89	88

DAILY GAUGE HEIGHT AND DISCHARGE of Mill Creek near Mountain Mill, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.84	424	2.45	248
2.....			2.95	479	2.50	268
3.....				650a	2.56	294
4.....				590	3.27	639
5.....				460a	3.24	624
6.....			2.74	376	3.14	574
7.....			2.86	434	3.02	514
8.....	1.54	53	3.15	579	2.86	434
9.....			3.15	579	2.80	405
10.....			3.05	529	2.85	430
11.....			2.89	449	2.98	494
12.....			2.65	334	3.00	504
13.....			3.01	509	3.01	509
14.....			3.36	684	3.15	579
15.....			3.05	529	3.25	629
16.....			3.20	604	3.20	604
17.....			3.23	619	3.10	554
18.....	2.10	132	3.15	579	3.03	519
19.....	2.10	132	2.95	479	2.97	489
20.....	2.15	146	2.85	430	2.81	410
21.....	2.25	176	2.85	430	2.78	395
22.....	2.27	182	2.89	449	2.64	329
23.....	2.20	160	2.99	499	2.58	302
24.....	2.15	146	3.04	524	2.56	294
25.....	2.15	146	2.75	381	2.96	484
26.....	2.15	146	2.78	395	2.64	329
27.....	2.15	146	2.75	381	2.49	264
28.....	2.13	140	2.75	381	2.44	244
29.....	2.13	140	2.75	381	2.41	232
30.....	2.45	248	2.71	362	2.43	240
31.....			2.63	325		

a to a Estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Mill Creek near Mountain Mill, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.42	236	2.76	386	1.67	62	1.95	100
2.....	2.45	248	2.53	281	1.82	78	2.00	109
3.....	2.36	214	2.52	277	1.72	66	1.98	105
4.....	2.28	186	2.42	236	1.67	62	1.98	105
5.....	2.31	196	2.30	192	1.61	57	2.15	146
6.....	2.23	170	2.18	154	1.61	57	2.10	132
7.....	2.27	182	2.16	149	1.72	66	2.05	121
8.....	2.21	163	2.07	125	1.67	62	2.01	111
9.....	2.17	152	2.04	118	1.95	100	1.97	103
10.....	2.12	138	1.95	100	1.90	90	1.92	94
11.....	2.08	127	1.92	94	1.82	78	1.87	85
12.....	2.04	118	1.87	85	1.80	75	2.05	121
13.....	2.01	111	1.87	85	1.76	71	2.00	109
14.....	1.98	105	1.87	85	1.74	68	1.98	105
15.....	1.94	98	1.87	85	1.85	83	1.95	100
16.....	1.94	98	1.87	85	2.09	130	1.94	98
17.....	2.57	298	1.87	85	2.05	121	1.96	101
18.....	2.61	316	1.87	85	2.05	121	1.95	100
19.....	2.50	268	1.87	85	2.10	132	1.95	100
20.....	2.32	199	1.92	94	2.06	123	2.00	109
21.....	2.18	154	1.94	98	2.06	123	2.00	109
22.....	2.10	132	1.92	94	2.15	146	2.04	118
23.....	2.07	125	1.90	90	2.10	132	2.01	111
24.....	2.07	125	1.87	85	2.04	118	2.02	114
25.....	2.07	125	1.87	85	2.00	109	2.02	114
26.....	2.17	152	1.86	84	1.95	100	2.01	111
27.....	2.36	214	1.84	81	2.02	114	2.00	109
28.....	2.62	320	1.82	78	2.07	125	1.99	107
29.....	2.80	405	1.77	72	2.05	121	1.99	107
30.....	2.72	367	1.75	70	1.97	103	1.97	103
31.....	2.89	449	1.72	66			1.97	103

## MONTHLY DISCHARGE of Mill Creek near Mountain Mill, for 1915.

(Drainage area 64 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in acre-feet.
April (18-30).....	248	53	149	2.330	1.21	4,137
May.....	684	325	478	7.469	8.61	29,391
June.....	639	232	428	6.687	7.46	25,468
July.....	449	98	200	3.125	3.60	12,298
August.....	386	66	122	1.906	2.20	7,501
September.....	146	57	96	1.500	1.67	5,712
October.....	146	85	108	1.687	1.94	6,641
The period.....					26.69	91,148

## CASTLE RIVER NEAR COWLEY.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 2, Tp. 7, Rge. 1, W. 5th Mer., at G. W. Buchanan's ranch.  
*Records available.*—August 5, 1909, to December 31, 1915; discharge measurements only in 1908.

*Gauge.*—Vertical staff. Elevation of zero maintained at 92.34 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Coarse gravel and not liable to shift.

*Discharge measurements.*—Made from the bridge at all stages.

*Observer.*—G. W. Buchanan.

DISCHARGE MEASUREMENTS of Castle River near Cowley, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 25.	J. E. Caughey	82	206	0.78	3.39	161
Feb. 24.	F. R. Steinberger	77	142	0.78	3.30	112
Mar. 12.	P. H. Daniells	82	169	0.68	2.73	114
Mar. 27.	do	57	71	2.10	2.10	149
April 10.	do	95	167	2.35	2.36	391
April 23.	do	115	267	3.78	3.15	986
May 8.	W. R. McCaffrey	133	493	4.82	4.26	2,378
May 20.	G. H. Whyte and W. R. McCaffrey	201	440	4.46	4.11	1,962
June 3.	W. R. McCaffrey	175	428	4.37	3.82	1,868
June 17.	do	210	533	4.56	4.25	2,428
July 5.	do	159	345	3.49	3.48	1,202
July 19.	do	143	316	3.20	3.16	1,011
Aug. 7.	do	108	256	2.59	2.81	665
Aug. 18.	do	100	209	2.28	2.50	480
Sept. 8.	do	79	106	2.92	2.20	310
Sept. 27.	do	105	203	2.42	2.51	490
Oct. 20.	do	105	242	2.34	2.61	568
Nov. 3.	do	100	210	2.32	2.52	485
Nov. 15.	do	54	93	3.46	2.45	321
Nov. 29.	do	52	65	3.24	2.54	211
Dec. 13.	do	52	69	2.63	2.54	183
Dec. 29.	do	39	64	2.93	3.99	188

DAILY GAUGE HEIGHT AND DISCHARGE of Castle River near Cowley, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	3.50	305	3.64	173	3.44	110	2.01	219	5.40	4,330	3.80	1,700
2.	3.43	304	3.54	173	3.49	113	2.19	305	5.40	4,330	3.90	1,840
3.	3.50	302	3.24	170	3.54	116	2.64	568	4.40	2,630	3.82	1,728
4.	3.55	299	3.19	166	3.15	120	2.61	547	4.30	2,460	4.30	2,460
5.	3.43	295	3.09	160	3.15	126	2.48	468	4.20	2,300	4.65	3,055
6.	3.25	290	3.14	153	3.10	133	2.36	396	4.10	2,140	4.25	2,380
7.	3.22	282	3.14	150	3.06	137	2.38	408	4.00	1,980	4.10	2,140
8.	3.15	275	3.09	145	2.94	138	2.38	408	4.25	2,380	4.10	2,140
9.	3.15	266	3.09	140	3.02	136	2.36	396	4.40	2,630	4.00	1,980
10.	3.20	259	3.04	136	3.07	126	2.36	396	4.30	2,460	4.15	2,220
11.	3.25	251	2.88	134	2.89	119	2.40	420	4.31	2,477	4.10	2,140
12.	3.28	244	2.93	134	2.73	115	2.47	462	4.11	2,156	4.00	1,980
13.	3.30	235	3.33	135	2.48	111	2.59	534	4.16	2,236	3.95	1,910
14.	3.30	226	3.53	137	2.18	106	2.97	826	4.51	2,817	4.50	2,800
15.	3.40	218	3.63	137	2.48	109	3.12	958	4.61	2,987	4.60	2,970
16.	3.09	211	3.83	136	3.23	115	2.97	826	4.41	2,647	4.40	2,630
17.	2.94	202	3.68	135	3.53	142	3.11	949	4.31	2,477	4.25	2,380
18.	2.98	195	3.43	133	3.46	100	3.27	1,093	4.41	2,647	4.30	2,460
19.	2.98	186	3.33	130	3.33	171	3.37	1,190	4.16	2,236	4.30	2,460
20.	3.02	180	3.18	127	3.18	179	3.37	1,190	4.11	2,156	4.10	2,140
21.	3.12	175	3.11	124	3.07	180	3.27	1,093	4.01	1,996	4.00	1,980
22.	3.06	170	3.03	118	2.97	180	3.17	1,003	3.96	1,924	3.90	1,840
23.	3.21	165	3.13	115	2.77	170	3.15	985	4.01	1,996	3.80	1,700
24.	3.35	163	3.08	113	2.82	144	3.15	985	4.01	1,996	3.75	1,635
25.	3.39	163	3.18	108	2.67	135	3.00	850	3.96	1,924	4.30	2,460
26.	3.44	160	3.43	107	2.66	139	2.95	810	3.91	1,854	4.10	2,140
27.	3.44	160	3.38	108	2.66	140	2.95	810	3.91	1,854	4.00	1,980
28.	3.49	161	3.41a	109	2.66	158	3.00	850	3.86	1,784	4.00	1,980
29.	3.54	164	.....	.....	2.46	173	3.00	850	3.81	1,714	3.80	1,700
30.	3.50	169	.....	.....	2.06	242	3.00	850	3.81	1,714	3.70	1,570
31.	3.64	172	.....	.....	1.96	196	.....	.....	3.81	1,714	.....	.....

a Interpolated

DAILY GAUGE HEIGHT AND DISCHARGE of Castle River near Cowley, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.65	1,510	3.40	1,220	2.20	310	2.50	480	2.55	510	2.50	215
2.....	3.60	1,450	3.30	1,120	2.22	320	2.50	480	2.55	510	2.55	220
3.....	3.55	1,390	3.15	985	2.30	360	2.60	540	2.52	492	2.45	227
4.....	3.55	1,390	3.00	850	2.28	350	2.60	540	2.55	510	2.44	229
5.....	3.48	1,308	2.90	770	2.25	335	2.65	575	2.55	510	2.50	230
6.....	3.48	1,308	2.90	770	2.21	315	2.65	575	2.55	510	2.55	231
7.....	3.45	1,275	2.81	698	2.20	310	2.60	540	2.53	425	2.60	230
8.....	3.24	1,066	2.75	650	2.20	310	2.60	540	2.50	395	2.55	227
9.....	3.15	985	2.60	540	2.50	480	2.60	540	2.50	358	2.50	217
10.....	3.00	850	2.60	540	2.45	450	2.62	554	2.50	330	2.48a	190
11.....	3.00	850	2.65	575	2.40	420	2.55	510	2.48	325	2.46a	168
12.....	2.95	810	2.60	540	2.38	408	2.53	498	2.46	337	2.43a	175
13.....	2.90	770	2.55	510	2.35	390	2.53	498	2.40	341	2.41	184
14.....	2.90	770	2.50	480	2.30	360	2.60	540	2.43	332	2.60	174
15.....	2.85	730	2.50	480	2.30	360	2.55	510	2.45	325	2.70	162
16.....	2.80	690	2.50	480	2.40	420	2.60	540	2.45	318	2.80	165
17.....	2.80	690	2.50	480	2.42	432	2.58	528	2.45	309	2.80	171
18.....	3.30	1,120	2.52	492	2.45	450	2.55	510	2.45	300	2.80	181
19.....	3.17	1,003	2.45	450	2.55	510	2.58	528	2.40	290	2.85	188
20.....	3.00	850	2.55	510	2.55	510	2.62	554	2.40	280	2.85	194
21.....	2.95	810	2.45	450	2.42	432	2.60	540	2.40	273	2.89	197
22.....	2.90	770	2.42	432	2.42	432	2.60	540	2.44	266	2.94	200
23.....	2.85	730	2.50	480	2.55	510	2.60	540	2.44	260	2.94	201
24.....	2.80	690	2.45	450	2.60	540	2.58	528	2.40	252	2.97	200
25.....	2.80	690	2.35	390	2.58	528	2.58	528	2.40	245	3.27	200
26.....	2.90	770	2.32	372	2.40	420	2.55	510	2.40	235	3.57	196
27.....	2.95	810	2.32	372	2.50	480	2.55	510	2.30	208	3.64	194
28.....	2.95	810	2.30	360	2.50	480	2.55	510	2.20	205	3.74	190
29.....	3.40	1,220	2.28	350	2.50	480	2.55	510	2.51	211	3.93	188
30.....	3.40	1,220	2.25	335	2.50	480	2.58	528	2.50	212	3.74	180
31.....	3.20	1,030	2.23	325	.....	.....	2.60	540	.....	.....	3.90	165

a Interpolated.

## MONTHLY DISCHARGE of Castle River near Cowley, for 1915.

(Drainage area 348 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	305	160	221	0.635	0.73	13,589
February.....	173	107	136	0.391	0.41	7,553
March.....	242	106	143	0.411	0.47	8,793
April.....	1,190	219	722	2.075	2.31	42,962
May.....	4,330	1,714	2,353	6.761	7.80	144,680
June.....	3,055	1,570	2,150	6.178	6.89	127,930
July.....	1,510	690	980	2.816	3.25	60,258
August.....	1,220	325	563	1.618	1.87	34,618
September.....	540	310	419	1.204	1.34	24,932
October.....	575	480	528	1.517	1.75	32,465
November.....	510	205	336	0.966	1.08	19,993
December.....	231	162	196	0.563	0.65	12,052
The year.....	.....	.....	.....	.....	28.55	529,825

## PINCHER CREEK AT PINCHER CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 23, Tp. 6, Rge. 30, W. of the 4th Mer., in the town of Pincher Creek.

*Records available.*—April 1, 1910, to October 31, 1915. Discharge measurements only: 1906-09.

SESSIONAL PAPER No. 25c

*Gauge.*—Vertical staff. Elevation of zero maintained at 86.35 feet since establishment.  
*Bench-mark.*—On right concrete abutment of bridge. Assumed elevation, 100.00 feet.  
*Channel.*—Rock, gravel and gumbo.  
*Discharge measurements.*—From bridge and by wading.  
*Winter flow.*—Station not maintained during the winter.  
*Observer.*—Hugh Bertles.

DISCHARGE MEASUREMENTS of Pincher Creek at Pincher Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 27.....	P. H. Daniells.....	37	28	1.33	2.44	37
April 10.....	do.....	41	29	1.59	2.52	46
April 23.....	do.....	43	33	1.73	2.59	57
May 8.....	do.....	60	71	3.34	3.25	237
May 20.....	G. H. Whyte and W. R. McCaffrey.....	76	76	3.65	3.31	280
June 3.....	W. R. McCaffrey.....	85	158	5.08	4.25	921
June 17.....	do.....	75	86	3.89	3.49	335
July 5.....	do.....	53	53	2.60	3.12	138
July 19.....	do.....	52	53	2.60	3.09	137
Aug. 6.....	do.....	51	49	2.23	3.00	110
Aug. 18.....	do.....	45	35	1.62	2.71	56
Sept. 8.....	do.....	39	24	1.39	2.50	34
Sept. 27.....	do.....	45	32	1.79	2.65	57
Oct. 20.....	do.....	46	36	2.02	2.75	72

DAILY GAUGE HEIGHT AND DISCHARGE of Pincher Creek at Pincher Creek, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.50	45	3.30	236	3.01	129
2.....			2.81	84	3.60	403	3.11	161
3.....			2.75	73	3.25	215	4.31	975
4.....			2.65	60	3.15	175	3.56	377
5.....			2.60	55	3.20	195	3.71	479
6.....			2.55	50	3.07	147	3.57	384
7.....			2.53	48	3.22	203	3.47	323
8.....			2.50	45	3.25	215	3.35	259
9.....			2.50	45	3.20	195	3.26	219
10.....	2.80	40a	2.50	45	3.15	175	3.47	323
11.....	2.78	50	2.50	45	3.05	141	3.36	264
12.....	2.82	55	2.50	45	2.95	113	3.46	317
13.....	2.80	65	2.57	52	3.27	223	3.37	269
14.....	2.78	65	2.84	90	3.80	545	3.92	638
15.....	2.82	70	2.70	66	3.45	311	4.02	720
16.....	2.88	75	2.66	61	3.40	284	3.57	384
17.....	2.90	80a	2.65	60	3.65	437	3.47	323
18.....	2.66	61	2.65	60	3.55	371	3.56	377
19.....	2.64	59	2.67	62	3.40	284	3.47	323
20.....	2.61	56	2.65	60	3.30	236	3.35	259
21.....	2.57	52	2.64	59	3.28	228	3.32	245
22.....	2.60	55	2.61	56	3.24	211	3.27	223
23.....	2.60	55	2.57	52	3.24	211	3.27	203
24.....	2.50	45	2.55	50	3.30	236	3.32	293
25.....	2.45	41	2.53	48	3.24	211	4.08	771
26.....	2.45	41	2.52	47	3.16	179	3.37	269
27.....	2.40	37	2.50	45	3.16	179	3.28	228
28.....	2.35	33	2.50	45	3.13	168	6.32	293
29.....	2.33	32	2.50	45	3.11	161	3.17	183
30.....	2.30	30	2.70	66	3.05	141	3.18	187
31.....	2.40	37			3.01	129		

a to a Estimated.



DAILY GAUGE HEIGHT AND DISCHARGE of Pincher Creek at Pincher Creek, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>F<sup>et</sup>.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.32	245	3.61	410	2.50	45	2.63	58
2.....	3.32	245	3.37	269	2.50	45	2.63	58
3.....	3.31	241	3.32	245	2.70	66	2.73	70
4.....	3.25	215	3.07	147	2.60	55	2.73	70
5.....	3.12	164	3.06	144	2.57	52	2.73	70
6.....	3.07	147	3.01	129	2.52	47	2.78	78
7.....	3.02	132	2.96	116	2.50	45	2.74	72
8.....	2.97	118	2.91	104	2.50	45	2.73	70
9.....	2.92	106	2.81	84	2.68	64	2.71	67
10.....	2.89	100	2.76	75	2.74	72	2.75	73
11.....	2.87	96	2.71	67	2.64	59	2.71	67
12.....	2.82	86	2.66	61	2.64	59	2.80	82
13.....	2.92	106	2.61	56	2.62	57	2.89	82
14.....	2.92	106	2.61	56	2.62	57	2.83	88
15.....	2.72	69	2.61	56	2.60	55	2.83	88
16.....	2.62	57	2.66	61	2.64	59	2.81	84
17.....	3.02	132	2.71	67	2.64	59	2.75	73
18.....	3.22	203	2.71	67	2.64	59	2.73	70
19.....	3.11	161	2.73	70	2.70	66	2.75	73
20.....	3.02	132	2.70	66	2.66	61	2.75	73
21.....	2.82	86	2.70	66	2.64	59	2.73	70
22.....	2.77	77	2.68	64	2.64	59	2.70	66
23.....	2.62	57	2.65	60	2.70	66	2.70	66
24.....	2.77	77	2.60	55	2.76	75	2.67	62
25.....	2.72	69	2.55	50	2.67	62	2.65	60
26.....	3.52	352	2.55	50	2.67	62	2.65	60
27.....	3.17	183	2.55	50	2.66	61	2.65	60
28.....	3.57	384	2.52	47	2.65	60	2.63	58
29.....	3.65	437	2.50	45	2.63	58	2.63	58
30.....	3.51	346	2.50	45	2.63	58	2.61	56
31.....	3.36	264	2.50	45	.....	.....	2.60	55

## MONTHLY DISCHARGE of Pincher Creek at Pincher Creek, for 1915.

(Drainage area 50 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (10-31).....	80	30	52	1.040	0.85	2,269
April.....	90	45	55	1.100	1.23	3,273
May.....	545	113	231	4.620	5.33	14,204
June.....	975	129	341	6.820	7.61	20,291
July.....	437	57	168	3.360	3.87	10,330
August.....	410	45	94	1.880	2.17	5,780
September.....	75	45	58	1.160	1.29	3,451
October.....	88	55	69	1.380	1.59	4,243
The period.....	.....	.....	.....	.....	23.94	63,841

## OLDMAN RIVER NEAR MACLEOD.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 10, Tp. 9, Rge. 26, W. 4th Mer., at the traffic bridge.*Records available.*—July 10, 1910, to December 31, 1915.*Gauge.*—Vertical staff. Zero of gauge maintained at 91.47 feet during 1913. Zero of gauge maintained at 87.67 feet during 1910, 1911, 1912, 1914 and 1915.*Bench-mark.*—Permanent bench-mark established on concrete pier. Assumed elevation, 100.00 feet.

SESSIONAL PAPER No. 25c

Channel.—Shifts slightly.

Discharge measurements.—Above from bridge.

Winter flow.—Records are obtained during the winter season 600 feet below the bridge.

Observer.—Mrs. W. A. Jackson.

DISCHARGE MEASUREMENTS of Oldman River near Macleod, in 1915.

Date.	Engineer	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 4.....	J. E. Caughey.....	102	289	1.78	4.21	515
Feb. 11.....	F. R. Steinberger.....	94	245	1.47	4.08	361
Mar. 1.....	do.....	93	221	1.43	3.90	316
Mar. 15.....	P. H. Daniells.....	100	288	2.00	4.47	576
Mar. 31.....	do.....	96	288	1.64	2.79	472
April 13.....	do.....	102	362	3.06	3.63	1,108
April 26.....	do.....	111	461	4.10	4.36	1,889
May 11.....	W. R. McCaffrey.....	339	1,304	5.15	7.07	6,729
May 29.....	do.....	264	1,064	5.05	6.37	5,376
June 10.....	do.....	332	974	4.80	6.05	4,672
June 23.....	do.....	251	1,097	5.11	6.55	5,605
June 29.....	do.....	343	1,278	5.05	6.99	6,451
July 9.....	do.....	146	634	5.72	5.71	3,622
July 27.....	do.....	115	506	4.38	4.75	2,179
Aug. 13.....	G. H. Whyte and W. R. McCaffrey.....	110	437	3.60	4.30	1,578
Aug. 26.....	W. R. McCaffrey.....	103	400	2.81	3.65	1,120
Sept. 15.....	do.....	109	352	2.56	3.34	899
Oct. 4.....	do.....	104	404	3.02	3.78	1,219
Oct. 22.....	do.....	104	414	3.00	3.73	1,243
Nov. 4.....	do.....	104	384	2.77	3.60	1,065
Nov. 18.....	do.....	96	332	2.34	3.15	777
Dec. 16.....	do.....	96	258	0.95	3.21	275

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman River near Macleod, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	4.11	480	3.90	354	3.88	316	3.00	640	5.20	2,800	5.99	4,122
2.....	4.11	496	3.90	356	3.88	315	3.30	850	7.84	8,712	5.99	4,122
3.....	4.01	509	3.90	355	3.86	308	3.60	1,070	7.84	8,712	6.09	4,742
4.....	4.01	515	3.95	356	3.82	299	4.00	1,410	7.74	8,432	6.90	6,310
5.....	4.01	515	4.00	356	3.77	294	4.00	1,410	7.59	8,023	7.00	6,530
6.....	4.01	452	4.00	357	3.72	300	3.90	1,320	7.54	7,888	6.80	6,100
7.....	4.01	443	4.00	358	3.98	317	3.80	1,230	7.39	7,484	6.35	5,210
8.....	4.00	465	4.00	360	3.87	338	3.80	1,230	7.24	7,100	6.24	5,012
9.....	3.90	478	4.00	364	4.08	370	3.75	1,190	7.24	7,100	6.15	4,850
10.....	3.80	475	4.00	366	4.18	400	3.70	1,150	7.24	7,100	6.04	4,652
11.....	3.70	460	3.99	361	4.23	430	3.70	1,150	7.24	7,100	6.00	4,580
12.....	3.70	438	4.09	330	4.28	462	3.70	1,150	6.50	5,500	6.00	4,580
13.....	3.70	420	4.09	322	4.30	504	3.80	1,230	6.35	5,210	6.30	5,120
14.....	3.80	408	4.09	330	4.34	541	4.40	1,800	7.40	7,510	6.50	5,500
15.....	3.80	408	4.09	340	4.47	576	4.50	1,900	7.40	7,510	7.10	6,760
16.....	3.75	418	4.14	346	5.19	618	4.80	2,250	7.39	7,484	7.21	7,025
17.....	3.67	442	4.29	348	3.99	619	5.00	2,510	7.38	7,458	7.36	7,406
18.....	3.60	458	4.29	346	3.89	600	5.07	2,608	7.38	7,458	7.51	7,807
19.....	3.57	458	4.29	342	3.69	578	5.10	2,650	7.25	7,125	7.61	8,277
20.....	3.50	450	4.29	339	3.39	561	5.13	2,695	7.10	6,760	7.46	7,672
21.....	3.50	438	4.24	333	3.34	555	5.18	2,770	7.00	6,530	7.01	6,553
22.....	3.50	420	4.19	328	3.29	550	5.00	2,510	6.85	6,205	6.71	5,920
23.....	3.55	400	4.14	325	3.30	540	4.80	2,250	6.60	5,700	6.55	5,600
24.....	3.60	384	4.08	321	3.30	528	4.65	2,070	6.60	5,700	6.41	5,320
25.....	3.65	366	4.08	320	3.00	510	4.40	1,800	6.50	5,500	6.41	5,320
26.....	3.75	350	4.18	318	2.90	460	4.36	1,760	6.40	5,300	8.41	10,308
27.....	3.80	334	3.98	317	2.70	444	4.30	1,700	6.40	5,300	8.01	9,188
28.....	3.75	332	3.88	317	2.70	440	4.30	1,700	6.35	5,210	7.51	7,807
29.....	3.75	337	.....	.....	3.00	040	4.30	1,700	6.29	5,102	6.94	6,332
30.....	3.75	346	.....	.....	2.90	580	4.30	1,700	6.19	4,922	6.71	5,920
31.....	3.80	352	.....	.....	2.80	520	.....	.....	6.09	4,742	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman River near Macleod, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.51	5,520	5.75	3,695	3.40	920	3.48	976	3.65	1,110	6.05	968
2.....	6.46	5,420	5.40	3,100	3.32	864	3.47	969	3.62	1,086	5.26	970
3.....	6.41	5,320	5.25	2,875	3.32	864	3.79	1,222	3.60	1,070	5.45	965
4.....	6.31	5,138	5.00	2,510	3.32	864	3.75	1,190	3.60	1,070	5.65	950
5.....	6.21	4,958	4.80	2,250	3.32	864	3.80	1,230	3.58	1,050	5.80	935
6.....	6.11	4,778	4.70	2,130	3.26	822	3.75	1,190	3.55	1,037	5.80	918
7.....	6.08	4,724	4.58	1,988	3.25	815	3.73	1,174	3.50	1,020	5.65	883
8.....	6.06	4,688	4.50	1,900	3.30	850	3.70	1,150	3.45	1,000	5.40	844
9.....	5.70	3,610	4.45	1,850	3.34	878	3.65	1,110	3.40	976	4.35	790
10.....	5.50	3,270	4.40	1,800	3.60	1,070	3.60	1,070	3.33	960	4.00	700
11.....	5.25	2,875	4.30	1,700	3.50	990	3.70	1,150	3.40	930	3.55	600
12.....	5.15	2,725	4.30	1,700	3.40	920	3.65	1,110	3.30	952	3.40	470
13.....	5.00	2,510	4.20	1,600	3.40	920	3.62	1,086	3.15	910	3.80	400
14.....	5.20	2,800	4.10	1,500	3.40	920	3.70	1,150	3.00	880	4.00	340
15.....	5.10	2,650	3.95	1,365	3.35	885	3.70	1,150	3.10	847	3.40	300
16.....	5.00	2,510	3.90	1,320	3.32	864	3.65	1,110	3.20	820	3.10	275
17.....	5.00	2,510	3.80	1,230	3.32	864	3.65	1,110	3.25	797	3.50	275
18.....	5.40	3,100	3.75	1,190	3.35	885	3.65	1,110	3.25	777	3.40	278
19.....	5.30	2,950	3.60	1,070	3.38	906	3.70	1,150	3.20	765	3.40	286
20.....	5.20	2,800	4.10	1,500	3.40	920	3.80	1,230	3.20	758	3.60	315
21.....	5.00	2,510	4.00	1,410	3.45	955	3.75	1,190	3.00	743	3.90	352
22.....	4.90	2,380	3.95	1,365	3.52	1,006	3.70	1,150	3.00	721	4.00	396
23.....	4.80	2,250	3.90	1,320	3.55	1,030	3.65	1,110	3.10	702	4.10	412
24.....	4.70	2,130	3.84	1,266	3.65	1,110	3.65	1,110	3.20	690	4.50	421
25.....	4.55	1,955	3.75	1,190	3.70	1,150	3.65	1,110	3.00	700	4.60	426
26.....	4.40	1,800	3.65	1,110	3.70	1,150	3.60	1,070	2.90	750	4.60	426
27.....	4.80	2,250	3.60	1,070	3.60	1,070	3.60	1,070	2.95	818	5.00	422
28.....	5.20	2,800	3.55	1,030	3.58	1,054	3.60	1,070	6.00	880	5.20	419
29.....	5.60	3,440	3.52	1,006	3.55	1,030	3.60	1,070	6.10	938	5.60	415
30.....	5.50	3,270	3.50	990	3.50	990	3.62	1,086	6.08	960	5.80	410
31.....	5.20	2,800	3.45	955	.....	.....	3.65	1,110	.....	.....	5.80	407

## MONTHLY DISCHARGE of Oldman River near Macleod, for 1915.

(Drainage area 2,255 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	515	332	427	0.189	0.22	26,255
February.....	366	317	342	0.152	0.16	18,994
March.....	619	294	468	0.208	0.24	28,776
April.....	2,770	640	1,713	0.760	0.85	101,930
May.....	8,712	2,800	6,538	2.899	3.34	402,006
June.....	10,308	4,122	6,155	2.729	3.04	378,456
July.....	5,520	1,800	3,311	1.469	1.69	203,585
August.....	3,695	955	1,645	0.725	0.84	101,147
September.....	1,150	815	948	0.420	0.47	56,410
October.....	1,230	969	1,122	0.498	0.57	68,989
November.....	1,110	690	891	0.395	0.44	53,018
December.....	970	275	547	0.243	0.28	33,634
The year.....	.....	.....	.....	.....	12.14	1,473,200

## CARMICHAEL DITCH NEAR STAVELEY.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 34, Tp. 13, Rge. 29, W. 4th Mer.*Records available.*—July 22, 1912, to October 31, 1915.*Gauge.*—Vertical staff.*Bench-mark.*—On post, at elevation of 4.51 feet above zero of gauge.*Discharge measurements.*—Made by weir.*Observer.*—J. Carmichael.*Remarks.*—No records were received for 1913-1914.

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DISCHARGE MEASUREMENTS of Carmichael Ditch near Stavely, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 30.....	W. R. McCaffrey.....	.....	.....	.....	0.208	0.336a
July 30.....	do.....	.....	.....	.....	0.250	0.499a
July 30.....	do.....	.....	.....	.....	0.312	0.684a
July 30.....	do.....	.....	.....	.....	0.333	0.910a

a Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Carmichael Ditch near Stavely, for 1915.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	.....	.....	0.29	0.65
2.....	.....	.....	0.33	0.91
3.....	.....	.....	0.29	0.65
4.....	.....	.....	0.29	0.65
5.....	.....	.....	0.29	0.65
6.....	.....	.....	0.29	0.65
7.....	.....	.....	0.29	0.65
8.....	.....	.....	0.29	0.65
9.....	.....	.....	0.29	0.65
10.....	.....	.....	0.29	0.65
11.....	.....	.....	0.29	0.65
12.....	.....	.....	0.29	0.65
13.....	.....	.....	0.29	0.65
14.....	.....	.....	0.29	0.65
15.....	.....	.....	0.29	0.65
16.....	.....	.....	0.29	0.65
17.....	.....	.....	0.29	0.65
18.....	.....	.....	0.29	0.65
19.....	.....	.....	0.29	0.65
20.....	.....	.....	0.29	0.65
21.....	.....	.....	0.29	0.65
22.....	.....	.....	0.29	0.65
23.....	.....	.....	0.29	0.65
24.....	.....	.....	0.29	0.65
25.....	.....	.....	0.29	0.65
26.....	.....	.....	0.29	0.65
27.....	.....	.....	Dry <sup>b</sup>	Nil.
28.....	0.29a	0.65	"	"
29.....	0.29	0.65	"	"
30.....	0.29	0.65	"	"
31.....	0.29	0.65		

a Headgates opened.

b Headgates closed for season June 27.

MONTHLY DISCHARGE of Carmichael Ditch near Stavely, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum	Mean.	
May (28-31).....	0.65	0.65	0.65	5
June (1-26).....	0.91	Nil.	0.66	34
The period.....				39

NOTE.—Headgates closed for season on June 27.

## TROUT CREEK AT LOCKWOOD'S RANCH.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 32, Tp. 11, Rge. 23, W. 4th Mer.

*Records available.*—July 7, 1911, to October 31, 1915.

*Gauge.*—Vertical staff; elevation 90.30 during 1911. elevation 92.19 during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gravel.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Station not maintained during winter.

*Observer.*—Mrs. G. P. Stewart.

## DISCHARGE MEASUREMENTS of Trout Creek at Lockwood's Ranch in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 16.....	P. H. Daniells.....	37.0	29.0	1.34	4.89	39
April 1.....	do.....	26.0	19.0	0.77	3.18	15
April 13.....	do.....	29.0	25.0	0.84	3.38	21
April 27.....	do.....	30.0	29.0	1.00	3.55	30
May 14.....	W. R. McCaffrey.....	36.0	69.0	2.50	4.65	173
May 28.....	do.....	36.0	66.8	3.54	4.60	237
June 11.....	do.....	35.0	58.3	3.40	4.34	198
June 24.....	do.....	52.0	94.3	3.41	4.94	321
July 10.....	do.....	36.5	75.0	3.92	4.64	294
July 28.....	do.....	33.0	50.6	3.57	4.10	178
Aug. 14.....	do.....	31.0	33.6	2.63	3.65	89
Sept. 2.....	do.....	29.0	25.2	2.10	3.28	53
Sept. 17.....	do.....	28.0	22.9	1.98	3.15	45
Oct. 7.....	W. H. Hoover.....	26.5	19.6	1.64	3.05	32
Oct. 23.....	W. R. McCaffrey.....	26.0	18.8	1.44	2.98	27
Nov. 5.....	do.....	17.9	25.0	1.08	2.96	27

## DAILY GAUGE HEIGHT AND DISCHARGE of Trout Creek at Lockwood's Ranch for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.30	18.0	3.83	53	4.31	192
2.....	3.45	24.0	4.18	97	4.37	203
3.....	3.55	30.0	4.42	133	4.37	203
4.....	3.50	27.0	4.42	133	4.40	208
5.....	3.42	23.0	4.44	136	4.53	234
6.....	3.35	20.0	4.40	130	4.47	222
7.....	3.37	21.0	4.42	133	4.47	222
8.....	3.35	20.0	4.39	128	4.49	226
9.....	3.32	18.8	4.35	122	4.49	226
10.....	3.35	20.0	4.32	117	4.49	226
11.....	3.40	22.0	4.27	110	4.51	230
12.....	3.43	24.0	4.30	114	4.51	230
13.....	3.49	26.0	4.36	124	4.52	232
14.....	3.40	22.0	4.60	164	4.55	238
15.....	3.40	22.0	4.93	227	4.57	243
16.....	3.45	24.0	4.94	229	4.57	243
17.....	3.47	26.0	5.11	265	4.51	230
18.....	3.52	28.0	5.36	318	5.01	336
19.....	3.52	28.0	5.23	290	4.89	310
20.....	3.52	28.0	5.19	282	5.04	343
21.....	3.55	30.0	4.97	236	5.06	348
22.....	3.55	30.0	5.02	339	5.05	346
23.....	3.57	31.0	4.95	323	5.05	346
24.....	3.55	30.0	4.96	325	5.04	343
25.....	3.55	30.0	5.00	334	5.56	463
26.....	3.55	30.0	4.86	304	6.62	707
27.....	3.54	29.0	4.81	293	5.97	557
28.....	3.54	29.0	4.64	257	5.86	532
29.....	3.54	29.0	4.66	262	5.68	490
30.....	3.58	32.0	4.45	218	5.41	428
31.....			4.35	199		

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DAILY GAUGE HEIGHT AND DISCHARGE OF Trout Creek at Lockwood's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	5.40	426	4.05	147	3.30	53	3.08	35
2.....	5.28	398	4.00	139	3.30	53	3.12	38
3.....	5.19	378	3.96	133	3.30	53	3.09	35
4.....	5.11	359	3.95	131	3.30	53	3.05	32
5.....	5.06	348	3.90	123	3.30	53	3.08	35
6.....	5.03	341	3.85	116	3.30	53	3.08	35
7.....	4.99	332	3.85	116	3.26	49	3.08	35
8.....	4.84	299	3.85	116	3.25	48	3.08	35
9.....	4.80	291	3.70	96	3.35	58	3.08	35
10.....	4.65	259	3.70	96	3.28	51	3.10	36
11.....	4.60	249	3.68	94	3.25	48	3.10	36
12.....	4.60	249	3.65	90	3.22	46	3.09	35
13.....	4.50	228	3.65	90	3.18	42	3.00	35
14.....	4.54	236	3.65	90	3.15	40	3.10	36
15.....	4.52	232	3.60	84	3.15	40	3.08	35
16.....	5.45	438	3.60	84	3.15	40	3.08	35
17.....	4.85	302	3.60	84	3.14	39	3.05	32
18.....	4.48	224	3.65	90	3.12	38	3.04	32
19.....	4.42	212	4.05	147	3.12	38	3.03	31
20.....	4.28	186	4.42	212	3.10	36	3.03	31
21.....	4.18	169	3.68	94	3.10	36	3.02	30
22.....	4.18	169	3.60	84	3.10	36	3.00	29
23.....	4.12	158	3.57	80	3.22	46	2.99	28
24.....	4.08	152	3.50	72	3.35	58	2.99	28
25.....	4.10	155	3.46	68	3.20	44	2.98	28
26.....	4.12	158	3.40	62	3.15	40	2.97	27
27.....	4.02	142	3.40	62	3.15	40	2.95	26
28.....	4.35	199	3.36	58	3.12	38	2.95	26
29.....	4.12	158	3.35	58	3.10	36	2.95	26
30.....	4.10	155	3.35	58	3.10	36	2.94	25
31.....	4.05	147	3.30	53	.....	.....	2.94	25

MONTHLY DISCHARGE OF Trout Creek at Lockwood's Ranch, for 1915.

(Drainage area 164 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	32	18	26	0.159	0.18	1,547
May.....	339	53	206	1.256	1.45	12,666
June.....	707	192	312	1.902	2.12	18,365
July.....	438	142	250	1.524	1.76	15,371
August.....	212	53	97	0.591	0.68	5,964
September.....	58	36	45	0.274	0.31	2,678
October.....	38	25	32	0.195	0.22	1,968
The period.....	.....	.....	.....	.....	6.72	58,759

MUDDYPOND CREEK AT HART'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 27, Tp. 11, Rge. 28, W. 4th Mer., at the foot-bridge on L. O. Hart's ranch.

*Records available.*—July 27, 1908, to October 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 91.06 feet during 1908-1911. Zero maintained at elevation of 90.06 feet during 1912-1915.

*Bench-mark.*—Permanent iron bench-mark, 35 feet northeast of gauge, assumed elevation 100.00 feet.

*Channel.*—Not liable to shift.

*Discharge measurements.*—Made from bridge at high water. Made by wading at low water.

*Observer.*—Mrs. M. E. Hart.

### DISCHARGE MEASUREMENTS of Muddypound Creek at Hart's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 16.....	P. H. Daniells.....	9.0	8.4	1.83	4.87	15.4
April 1.....	do.....	12.5	9.4	1.09	2.27	8.0
April 13.....	do.....	12.5	8.5	0.75	2.20	6.4
April 27.....	do.....	12.0	6.0	0.50	2.06	3.0
May 14.....	W. R. McCaffrey.....	14.0	16.2	1.69	2.82	27.0
May 28.....	do.....	13.5	16.4	1.59	2.82	26.0
June 11.....	do.....	13.0	14.4	1.33	2.71	19.0
June 24.....	do.....	13.5	17.5	1.82	2.96	32.0
July 10.....	do.....	13.5	21.0	1.85	3.20	38.0
July 28.....	do.....	13.5	21.0	1.80	3.10	37.0
Aug. 14.....	do.....	13.0	12.5	1.18	2.45	14.7
Sept. 2.....	do.....	12.0	11.5	1.01	2.35	11.6
Sept. 17.....	do.....	12.0	10.1	0.80	2.30	8.9
Oct. 7.....	W. H. Hannon.....	8.0	4.2	1.76	2.29	7.4
Oct. 23.....	W. R. McCaffrey.....	8.5	4.1	1.54	2.34	6.3

### DAILY GAUGE HEIGHT AND DISCHARGE of Muddypound Creek at Hart's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.28	8.2	2.26	7.7	2.71	21.0
2.....			2.34	9.8	2.38	10.9	2.77	23.0
3.....			3.42	51.0	2.24	7.2	2.79	23.0
4.....			2.28	8.2	2.24	7.2	2.76	22.0
5.....			2.20	6.2	2.25	7.4	2.73	21.0
6.....			2.19	6.0	2.25	7.4	2.69	20.0
7.....			2.18	5.7	2.25	7.4	2.79	23.0
8.....			2.16	5.2	2.25	7.4	2.72	21.0
9.....			2.16	5.2	2.25	7.4	2.67	19.4
10.....			2.15	5.0	2.25	7.4	2.62	17.8
11.....			2.15	5.0	2.25	7.4	2.73	21.0
12.....			2.15	5.0	2.25	7.4	2.67	19.4
13.....			2.18	5.7	2.30	8.7	2.66	19.1
14.....			2.20	6.2	2.70	20.0	2.86	26.0
15.....			2.18	5.7	2.68	19.7	2.93	28.0
16.....	4.91	24.0a	2.17	5.5	2.74	22.0	2.81	24.0
17.....	4.57	40.0	2.17	5.5	2.78	23.0	2.86	26.0
18.....	4.09	50.0	2.16	5.2	2.90	27.0	3.01	32.0
19.....	3.49	38.0	2.13	4.5	2.90	27.0	3.04	33.0
20.....	3.39	34.0	2.11	4.0	2.90	27.0	2.99	31.0
21.....	3.09	16.0	2.10	3.8	2.96	30.0	2.93	28.0
22.....	2.44	12.0	2.10	3.8	3.02	32.0	2.99	31.0
23.....	2.34	11.0	2.10	3.8	3.01	32.0	3.01	32.0
24.....	2.29	8.0	2.10	3.8	3.00	31.0	2.97	30.0
25.....	2.27	8.0a	2.10	3.8	2.98	30.0	4.23	93.0
26.....	2.25	7.4	2.07	3.2	2.86	26.0	4.11	87.0
27.....	2.20	6.2	2.05	2.8	2.86	26.0	3.65	63.0
28.....	2.20	6.2	2.05	2.8	2.85	26.0	3.61	61.0
29.....	2.14	4.8	2.05	2.8	2.77	23.0	4.11	87.0
30.....	2.13	4.5	2.05	2.8	2.72	21.0	3.63	62.0
31.....	2.16	5.2			2.71	21.0		

a-a Estimated.



SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Muddypound Creek at Hart's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.64	62.0	2.62	17.8	2.50	14.2	2.29	8.4
2.....	3.60	60.0	2.64	18.4	2.38	10.9	2.29	8.4
3.....	3.50	55.0	2.62	17.8	2.34	9.8	2.30	8.7
4.....	3.46	53.0	2.62	17.8	2.34	9.8	2.30	8.7
5.....	3.42	51.0	2.60	17.2	2.34	9.8	2.30	8.7
6.....	3.42	51.0	2.59	16.9	2.34	9.8	2.35	10.0
7.....	3.42	51.0	2.59	16.9	2.32	9.2	2.28	8.2
8.....	3.42	51.0	2.59	16.9	2.32	9.2	2.28	8.2
9.....	3.34	47.0	2.58	16.6	2.32	9.2	2.28	8.2
10.....	3.20	40.0	2.56	16.0	2.30	8.7	2.30	8.7
11.....	3.13	37.0	2.55	15.7	2.29	8.4	2.28	8.2
12.....	3.08	35.0	2.54	15.4	2.29	8.4	2.28	8.2
13.....	3.06	34.0	2.53	15.1	2.29	8.4	2.27	8.0
14.....	3.06	34.0	2.52	14.8	2.29	8.4	2.27	8.0
15.....	3.05	33.0	2.51	14.5	2.29	8.4	2.27	8.0
16.....	3.04	33.0	2.51	14.5	2.29	8.4	2.27	8.0
17.....	3.03	32.0	2.51	14.5	2.29	8.4	2.26	7.7
18.....	3.02	32.0	2.51	14.5	2.29	8.4	2.26	7.7
19.....	2.11	4.0	2.51	14.5	2.29	8.4	2.26	7.7
20.....	2.09	3.6	5.80	175.0	2.29	8.4	2.26	7.7
21.....	2.06	3.0	2.71	21.0	2.29	8.4	2.25	7.4
22.....	2.33	9.5	2.60	17.2	2.29	8.4	2.24	7.2
23.....	2.94	29.0	2.55	15.7	2.32	9.2	2.24	7.2
24.....	2.72	21.0	2.54	15.4	2.38	10.9	2.23	7.0
25.....	2.54	15.4	2.53	15.1	2.32	9.2	2.23	4.0
26.....	2.52	14.8	2.52	14.8	2.29	8.4	2.22	6.7
27.....	2.91	28.0	2.51	14.5	2.29	8.4	2.22	6.7
28.....	3.34	47.0	2.50	14.2	2.29	8.4	2.22	6.7
29.....	2.87	26.0	2.50	14.2	2.29	8.4	2.21	6.4
30.....	2.66	19.1	2.50	14.2	2.29	8.4	2.21	6.4
31.....	2.63	18.1	2.50	14.2	.....	.....	2.20	6.2

MONTHLY DISCHARGE of Muddypound Creek at Hart's Ranch, for 1915.

(Drainage area 44 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (16-31).....	50.0	4.5	17.2	0.391	0.23	546
April.....	51.0	2.8	6.5	0.148	0.17	387
May.....	32.0	7.2	18.3	0.416	0.48	1,125
June.....	93.0	17.8	35.0	0.796	0.89	2,082
July.....	62.0	3.0	33.0	0.750	0.86	2,029
August.....	175.0	14.2	21.0	0.478	0.55	1,291
September.....	14.2	8.4	9.1	0.207	0.23	541
October.....	10.0	4.0	7.6	0.173	0.20	467
The period.....	.....	.....	.....	.....	3.61	8,468

## WILLOW CREEK AT CONNOLLY'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 20, Tp. 9, Rge. 26, W. 4th Mer.

*Records available.*—August 13, 1915, to December 31, 1915.

*Gauge.*—Vertical staff.

*Bench-marks.*—Temporary. (1) On post of gateway near barn. Elevation, 10.35 feet above zero of gauge. (2) Nail driven in corner of barn. Elevation, 9.90 feet above zero of gauge.

*Channel.*—One channel except at very high stages; clean gravel and sand bottom.

*Discharge measurements.*—Made from bridge, except at low water.

*Observer.*—J. Connolly.

## DISCHARGE MEASUREMENTS of Willow Creek at Connolly's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 13.....	G. W. Whyte and W. R. McCaffrey.....	110	192	1.99	2.06	382
Aug. 26.....	W. R. McCaffrey.....	101	172	1.75	1.91	300
Sept. 15.....	do.....	71	138	1.52	1.63	211
Oct. 4.....	do.....	70	140	1.49	1.58	209
Nov. 4.....	do.....	70	113	1.22	1.39	138
Nov. 18.....	do.....	43	40	2.77	1.30	110
Dec. 2.....	do.....	43.5	49	1.58	1.20	78
Dec. 16.....	do.....	67	90	1.01	1.08	90

## DAILY GAUGE HEIGHT AND DISCHARGE of Willow Creek at Connolly's Ranch, for 1915.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.00	345	1.48	168	1.34	127	1.18	90
2.....			2.00	345	1.98	338	1.34	127	1.23	101
3.....			2.00	345	1.57	196	1.34	127	1.23	101
4.....			2.04	360	1.66	226	1.37	135	1.23	101
5.....			2.00	345	1.62	213	1.39	140	1.28	112
6.....			2.00	345	1.58	200	1.38	138	1.23	101
7.....			2.00	345	1.63	216	1.34	127	1.38	138
8.....			2.00	345	1.63	216	1.32	122	1.36	133
9.....			2.04	360	1.58	200	1.29	115	1.33	125
10.....			2.04	360	1.63	216	1.36	133	1.33	125
11.....			2.09	378	1.63	216	1.29	115	1.28	112
12.....			2.09	378	1.61	209	1.29	115	1.28	112
13.....	2.06	367	2.09	378	1.63	216	1.45	159	1.28	112
14.....	2.10	382	2.05	363	1.63	216	1.45	159	1.23	101
15.....	2.06	367	1.65	222	1.63	216	1.45	159	1.18	90
16.....	2.04	360	2.03	356	1.63	216	1.30	117	1.21	96
17.....	2.04	360	2.03	356	1.61	209	1.40	143	1.22	99
18.....	2.07	371	1.69	236	1.48	168	1.43	152	1.33	125
19.....	4.09	1,177	1.51	177	1.47	165	1.67	229	1.28	112
20.....	3.03	752	1.56	193	1.38	138	1.71	242	1.23	101
21.....	3.10	781	1.53	184	1.38	138	1.41	146	1.19	92
22.....	2.40	501	1.53	184	1.51	177	1.41	146	1.18	90
23.....	2.40	501	1.54	187	1.47	165	1.41	146	1.23	101
24.....	2.06	367	1.54	187	1.48	168	1.41	146	1.28	112
25.....	2.06	367	1.83	283	1.46	162	1.41	146	1.33	125
26.....	2.00	345	1.81	277	1.49	171	1.37	135	1.23	101
27.....	2.09	378	1.58	200	1.44	155	1.22	99	1.33	125
28.....	2.09	378	1.55	190	1.41	146	1.42	149	1.23	101
29.....	2.09	378	1.53	184	1.40	143	1.32	122	1.18	90
30.....	2.00	345	1.53	184	1.40	143	1.22	99	1.23	101
31.....	2.00	345			1.36	133			1.03	63

MONTHLY DISCHARGE of Willow Creek at Connolly's Ranch, for 1915.

(Drainage area 1,006 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
August (13-31).....	1,177	345	464	0.461	0.33	17,486
September.....	378	177	286	0.284	0.32	17,018
October.....	338	133	189	0.188	0.22	11,621
November.....	242	99	140	0.139	0.16	8,331
December.....	138	63	106	0.105	0.12	6,518
The period.....					1.15	60,974

WILLOW CREEK NEAR MACLEOD.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 26, Tp. 9, Rge. 26, W. 4th Mer.

*Records available.*—July 1, 1909, to August 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 90.84 feet during 1910-15.

*Bench-mark.*—Permanent iron bench-mark located 39 feet northwest of the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Consists of clean gravel and is not liable to shift.

*Discharge measurements.*—Made from bridge during flood stages and by wading at low stages.

*Observer.*—Hugh McLean.

*Remarks.*—A new station was established on this stream at Conolly's ranch about 6 miles upstream on August 13, 1915, to replace this station.

DISCHARGE MEASUREMENTS of Willow Creek near Macleod, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 31.....	P. H. Daniells.....	60 0	88	1.23	2.30	108
April 13.....	do.....	61 0	92	1.25	2.33	115
April 26.....	do.....	71 0	105	1.47	2.58	154
May 11.....	W. R. McCaffrey.....	99 0	217	2.65	3.86	576
May 29.....	do.....	101 0	303	3.31	4.70	1,004
June 10.....	do.....	101 0	290	3.36	4.63	973
June 23.....	do.....	102 0	355	3.98	5.44	1,416
June 26.....	do.....	140 0	760	5.20	9.28	3,952 <sup>a</sup>
July 9.....	do.....	103 0	350	4.29	5.56	1,499
July 27.....	do.....	98 5	244	3.16	4.37	771
Aug. 26.....	do.....	87 0	148	2.40	3.28	355
Oct. 4.....	do.....	160 0	108	1.84	2.80	197
Oct. 22.....	do.....	71 0	120	1.42	1.53	179

<sup>a</sup> Flood. Slope determination.

## DAILY GAUGE HEIGHT AND DISCHARGE of Willow Creek near Macleod, for 1915.

DAY.	March.		April.		May.		June.		July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.30	108	2.44	128	4.28	773	6.44	2,012	4.43	855
2.....			2.35	115	2.59	154	4.28	773	6.34	1,950	4.45	867
3.....			2.40	122	4.99	1,166	4.93	1,133	6.29	1,919	4.40	839
4.....			2.42	125	4.64	971	4.91	1,122	5.89	1,680	4.35	812
5.....			2.45	130	4.29	778	4.88	1,105	5.89	1,680	4.20	729
6.....			2.60	156	4.29	778	4.88	1,105	6.10	1,804	4.10	674
7.....			2.65	166	4.26	762	4.93	1,133	6.15	1,834	4.04	642
8.....			2.50	138	4.24	751	4.93	1,133	6.15	1,834	3.98	610
9.....			2.50	138	4.24	751	4.88	1,105	5.35	1,368	3.92	580
10.....			2.45	130	3.89	565	4.78	1,049	5.20	1,284	3.70	477
11.....			2.35	115	3.84	541	4.69	998	5.16	1,262	3.62	444
12.....			2.31	109	3.89	565	4.69	998	4.93	1,133	3.55	418
13.....			2.33	112	3.89	565	4.64	971	4.74	1,026	3.50	399
14.....			2.40	122	3.99	615	5.09	1,222	4.76	1,038	3.48	392
15.....			2.40	122	6.10	1,804	5.09	1,222	4.90	1,116	3.45	382
16.....			2.43	127	5.49	1,446	5.19	1,278	5.14	1,194	3.45	382
17.....			2.45	120	5.34	1,362	5.24	1,306	5.00	1,172	3.45	382
18.....			2.48	135	5.24	1,306	5.14	1,250	4.93	1,133	3.45	382
19.....			2.48	135	5.24	1,306	5.40	1,987	4.60	949	5.10	1,228
20.....			2.49	136	5.19	1,278	7.04	2,403	4.55	922	4.65	977
21.....			2.49	136	5.28	1,329	6.60	2,114	4.46	872	4.40	839
22.....	2.91	223	2.49	136	5.33	1,357	6.15	1,834	4.35	812	4.08	663
23.....	2.81	199	2.47	133	5.33	1,357	5.69	1,562	4.35	812	3.63	448
24.....	3.16	291	2.45	130	5.33	1,357	5.54	1,475	4.33	800	3.50	399
25.....	3.11	277	2.45	130	5.33	1,357	7.00	2,377	4.50	894	3.35	348
26.....	3.06	263	2.47	133	5.28	1,329	9.28	3,959	4.45	867	3.20	302
27.....	2.86	211	2.47	133	5.13	1,245	8.57	3,449	4.45	867	3.16	291
28.....	2.68	172	2.50	138	4.88	1,105	7.86	2,952	4.50	894	3.12	280
29.....	2.64	164	2.44	128	4.70	1,004	7.15	2,476	4.63	965	3.10	274
30.....	2.61	158	2.42	125	4.58	938	6.45	2,019	4.75	1,032	3.05	260
31.....	2.30	108			4.43	855			4.50	894	3.03	254

## MONTHLY DISCHARGE of Willow Creek near Macleod, for 1915.

(Drainage area 1,013 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	291	108	207	0.204	0.08	4,106
April.....	166	108	130	0.128	0.14	7,736
May.....	1,804	128	994	0.981	1.13	61,119
June.....	3,959	773	1,609	1.588	1.77	95,743
July.....	2,012	800	1,226	1.210	1.40	75,384
August.....	1,228	254	543	0.536	0.62	33,388
The period.....					5.14	277,476

## OLDMAN (BELLY) RIVER NEAR LETHBRIDGE.

*Location.*—On the traffic bridge on the NW.  $\frac{1}{4}$  Sec. 1, Tp. 9, Rge. 22, W. 4th Mer.*Records available.*—August 31, 1911, to December 31, 1915.*Gauge.*—Chain gauge. Elevation of zero maintained at 87.82 feet during 1911-12; 85.70 feet during 1913-15.*Bench-mark.*—Top of arrow marked with white paint on the right abutment. Assumed elevation, 100.00 feet.*Discharge measurements.*—Made from downstream side of the traffic bridge.*Winter flow.*—Obtained through the ice one-half mile below the traffic bridge.*Observer.*—Wm. Bedster.

DISCHARGE MEASUREMENTS of Oldman (Belly) River near Lethbridge, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 13.....	O. H. Hoover.....	175	714	1.40	3.47	997
Jan. 26.....	W. A. Burton.....	158	649	1.12	3.09	725
Feb. 13.....	J. E. Degnan.....	147	606	1.21	3.38	731
Mar. 4.....	do.....	141	582	1.15	3.08	670
Mar. 17.....	P. H. Daniels.....	365	1,783	2.26	4.85	4,032
April 5.....	do.....	353	1,609	1.89	3.66	3,043
April 19.....	do.....	348	1,551	1.72	3.34	2,677
April 29.....	do.....	380	1,806	2.25	4.21	4,057
May 12.....	W. R. McCaffrey.....	491	3,222	3.75	7.00	12,096
May 25.....	do.....	491	2,998	3.48	6.71	10,440
June 7.....	do.....	493	3,616	4.33	7.95	15,646
June 21.....	do.....	464	3,563	4.57	8.36	16,288
June 26.....	J. E. Degnan.....	589	4,401	5.21	9.55	22,965
June 28.....	do.....	495	4,314	4.91	9.36	21,174
June 30.....	do.....	582	3,661	4.29	8.16	15,689
July 12.....	W. R. McCaffrey.....	446	2,656	3.05	6.05	8,112
July 24.....	do.....	384	2,268	2.74	5.15	6,204
Aug. 10.....	do.....	374	2,111	2.48	4.71	5,240
Aug. 23.....	do.....	374	2,052	2.27	4.68	4,656
Sept. 22.....	do.....	366	1,864	1.94	4.02	3,622
Oct. 9.....	do.....	370	2,006	2.12	4.28	4,264
Oct. 26.....	do.....	352	1,681	1.86	3.79	3,124
Nov. 23.....	W. H. Storey.....	.....	.....	.....	2.82	.....
Dec. 16.....	do.....	320	1,166	0.81	2.28	950

a Measurement impossible owing to slush ice.

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman (Belly) River near Lethbridge, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.97	1,283	3.24	693	3.25	683	2.55	1,730	4.35	4,280	6.25	8,990
2.....	3.98	1,244	3.31	716	3.25	679	2.76	1,940	5.90	8,010	6.29	9,110
3.....	3.98	1,180	3.33	722	3.15	676	2.80	1,980	6.25	8,990	6.40	9,440
4.....	3.94	1,120	3.36	729	3.07	670	3.50	2,810	7.15	11,935	7.09	11,714
5.....	3.95	1,060	3.39	732	3.03	662	3.66	3,046	6.74	10,502	8.33	16,669
6.....	3.90	1,035	3.36	736	3.00	655	3.85	3,355	5.51	6,957	8.30	16,540
7.....	3.82	1,035	3.35	738	2.96	646	4.00	3,610	6.15	8,700	7.86	14,672
8.....	3.73	1,046	3.35	738	3.03	642	3.70	3,110	6.16	8,728	7.74	14,174
9.....	3.80	1,059	3.34	736	3.03	647	3.35	2,610	6.20	8,840	7.64	13,776
10.....	3.81	1,060	3.37	733	2.86	660	2.90	2,090	6.65	10,210	7.54	13,392
11.....	3.72	1,053	3.37	730	2.88	675	3.18	2,407	7.16	11,972	7.39	12,823
12.....	3.71	1,030	3.37	729	2.84	690	3.05	2,258	7.21	12,157	7.16	11,972
13.....	3.54	997	3.39	731	2.84	716	3.11	2,327	6.80	10,700	7.16	11,972
14.....	3.43	965	3.47	746	2.68	763	3.35	2,610	6.70	10,370	7.42	12,936
15.....	3.47	900	3.33	766	2.85	806	3.60	2,950	7.80	14,420	7.47	13,126
16.....	3.33	850	3.25	764	2.95	960	3.51	2,824	7.89	14,798	7.41	12,898
17.....	3.11	855	3.24	743	4.86	4,032	3.70	3,110	7.50	13,240	7.06	15,092
18.....	3.12	884	3.23	720	4.83	4,600	4.15	3,895	7.35	12,675	8.17	15,981
19.....	3.14	890	3.30	706	4.80	5,100	4.36	4,300	7.70	14,010	8.64	18,030
20.....	3.19	880	3.32	697	5.20	6,160	4.56	4,712	7.43	12,974	8.63	17,985
21.....	3.25	850	3.35	696	4.05	3,705	4.67	4,954	6.94	11,180	8.27	16,411
22.....	3.26	800	3.31	697	4.05	3,705	4.72	5,064	6.73	10,469	7.74	14,124
23.....	3.22	775	3.31	700	4.30	4,180	4.82	5,286	6.55	9,895	7.31	12,527
24.....	3.21	754	3.32	708	4.50	4,580	4.87	5,401	6.57	9,957	7.24	12,268
25.....	3.20	734	3.25	708	4.40	2,670	4.53	4,646	6.71	10,403	7.67	13,893
26.....	3.10	725	3.22	705	2.55	1,730	4.43	4,440	6.70	10,370	8.86	19,936
27.....	3.20	710	3.25	698	2.58	1,760	4.31	4,200	6.65	10,210	9.49	23,100
28.....	3.20	668	3.19	690	2.50	1,680	4.27	4,143	6.55	9,895	8.91	19,257
29.....	3.20	645	.....	.....	2.78	1,960	4.31	4,200	6.47	9,650	8.35	16,755
30.....	3.21	648	.....	.....	2.71	1,890	4.33	4,240	6.44	9,560	8.04	15,428
31.....	3.20	666	.....	.....	2.65	1,830	.....	.....	6.40	9,440	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman (Belly) River near Lethbridge, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	7.85	14,630	6.14	8,672	3.43	2,712	3.63	2,998	3.73	3,158	2.15	1,040
2.....	8.10	15,680	6.09	8,532	3.48	2,782	3.55	2,880	3.72	3,142	2.10	1,023
3.....	7.70	14,010	5.99	8,253	3.62	2,982	3.56	2,894	3.70	3,110	2.07	1,025
4.....	7.69	13,971	5.76	8,132	3.76	3,206	3.77	3,222	3.66	3,046	2.02	1,040
5.....	7.63	13,737	5.48	6,878	4.59	4,778	4.02	3,648	3.63	2,998	2.90	1,068
6.....	6.93	11,145	5.14	6,022	4.15	3,895	4.25	4,085	3.58	2,922	2.82	1,073
7.....	6.84	10,836	5.02a	5,746	3.95	3,525	4.26	4,104	3.54	2,866	2.80	1,070
8.....	6.76	10,568	4.90	5,470	3.81	3,287	4.33	4,240	3.52	2,838	2.75	1,060
9.....	6.63	10,146	4.77	5,174	3.70	3,110	4.31	4,200	3.51	2,824	2.77	1,050
10.....	6.50	9,740	4.72	5,064	3.64	3,014	4.33	4,240	3.37	2,634	2.80	1,034
11.....	6.22	8,900	4.57	4,734	3.71	3,126	4.23	4,047	3.20	2,400	2.77	1,010
12.....	5.96	8,172	4.44	4,460	3.95	3,525	4.23	4,047	3.10	2,200	2.76	990
13.....	5.79	7,713	4.34	4,260	3.83	3,321	4.20	3,990	2.90	2,095	2.73	972
14.....	5.65	7,335	4.32	4,240	3.70	3,110	4.25	4,085	2.70	2,010	2.72	960
15.....	5.46	6,826	4.34	4,260	3.61	2,966	4.21	4,009	2.90	1,955	2.39	955
16.....	5.34	6,514	4.23	4,047	3.54	2,866	4.20	3,990	3.00	1,900	2.28	950
17.....	5.37	6,592	4.30	4,180	3.50	2,810	4.17	3,933	3.21	1,855	2.22	940
18.....	5.44	6,774	4.35	4,280	3.61	2,966	4.08	3,762	3.19	1,800	2.19	897
19.....	6.44	6,774	4.50	4,580	3.75	3,190	3.96	3,542	3.20	1,755	2.15	876
20.....	5.94	8,118	4.72	5,064	3.88	3,406	3.96	3,542	3.15	1,710	2.27	880
21.....	5.54	7,038	5.50	6,930	4.08	3,762	3.95	3,525	2.75	1,660	2.49	893
22.....	5.36	6,566	5.30	6,410	4.00	3,610	3.93	3,491	2.78	1,590	2.78	913
23.....	5.17	6,091	4.70	5,020	3.94	3,508	3.90	3,440	2.86	1,520	3.10	937
24.....	5.19	6,137	4.40	4,380	3.95	3,525	3.82	3,304	2.95	1,450	3.14	952
25.....	5.33	6,488	4.23	4,047	3.90	3,440	3.77	3,232	2.72	1,390	3.15	966
26.....	5.13	5,999	4.11	3,819	4.00	3,610	3.79	3,094	2.54	1,330	3.10	982
27.....	5.09	5,907	3.93	3,491	4.02	3,648	3.76	3,206	2.38	1,270	3.07	990
28.....	5.88	7,956	3.81	3,287	3.90	3,440	3.74	3,174	2.20	1,210	3.05	997
29.....	7.43	12,974	3.70	3,110	3.78	3,238	3.70	3,110	2.19	1,140	3.05	997
30.....	6.99	11,355	3.59	2,936	3.70	3,110	3.74	3,174	2.17	1,080	3.02	990
31.....	6.39	9,410	3.51	2,824	.....	.....	3.71	3,126	.....	.....	3.07	980

a Interpolated.

MONTHLY DISCHARGE of Oldman (Belly) River near Lethbridge, for 1915.

(Drainage area 6,764 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	1,283	645	916	0.135	0.16	56,323
February.....	766	690	722	0.107	0.11	40,098
March.....	6,160	642	1,962	0.290	0.33	120,638
April.....	5,401	1,730	3,475	0.514	0.57	206,777
May.....	14,798	4,280	10,500	1.552	1.79	645,620
June.....	22,100	8,990	14,438	2.135	2.38	859,121
July.....	15,680	5,907	9,165	1.355	1.56	563,534
August.....	8,672	2,824	5,107	0.755	0.87	314,017
September.....	4,778	2,712	3,316	0.490	0.55	197,316
October.....	4,240	2,880	3,591	0.531	0.61	220,802
November.....	3,158	1,080	2,095	0.310	0.35	124,661
December.....	1,073	876	984	0.145	0.17	60,504
The year.....	.....	.....	.....	.....	9.45	3,409,411

SESSIONAL PAPER No. 25c

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Oldman drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Mar. 23....	P. H. Daniells....	Allison Creek....	SW. 11-8-5-5....	13.0	5.65	1.67	9 400
April 6....	do	do	do	15.0	6.45	1.40	9 000
April 17....	do	do	do	12.0	6.46	1.48	9 600
May 4....	do	do	do	14.0	9.80	2.65	26 000
May 18....	W. R. McCaffrey...	do	do	14.0	11.20	2.88	32 000
May 31....	do	do	do	14.0	11.90	2.84	34 000
June 30....	do	do	do	14.0	14.20	3.65	52 000
July 16....	do	do	do	14.0	11.42	2.71	31 000
Aug. 2....	do	do	do	14.0	10.60	1.94	21 000
Aug. 16....	do	do	do	14.0	10.15	1.82	18 500
Sept. 9....	do	do	do	14.0	9.63	1.82	17 600
Sept. 24....	do	do	do	14.0	9.55	1.66	15 800
Oct. 18....	do	do	do	13.0	8.58	1.33	11 400
Mar. 24....	P. H. Daniells....	Bellevue Creek....	NE. 29-7-3-5....				0.679a
April 7....	do	do	do				0.679a
April 19....	do	do	do				0.698a
May 5....	do	do	do				1.600a
May 17....	W. R. McCaffrey...	do	do				1.673a
June 1....	do	do	do				1.130a
June 14....	do	do	do				1.269a
June 26....	do	do	do				1.550a
July 17....	do	do	do				1.000a
Aug. 3....	do	do	do				0.716a
Aug. 17....	do	do	do				0.717a
Sept. 10....	do	do	do				1.112a
Sept. 25....	do	do	do				0.604a
Oct. 19....	do	do	do				0.679a
Oct. 30....	do	do	do				0.717a
Nov. 12....	do	do	do				0.641a
Dec. 11....	do	do	do				0.641a
Dec. 28....	do	do	do				0.534a
Mar. 24....	P. H. Daniells....	Blairmore Creek....	SE. 3-8-4-5....	12.0	6.20	1.34	8 300
April 7....	do	do	do	21.0	14.80	2.13	31 600
April 19....	do	do	do	20.0	19.05	2.31	44 000
May 5....	do	do	do	23.0	26.00	3.62	94 000
May 17....	W. R. McCaffrey...	do	do	22.0	23.80	3.44	82 000
June 1....	do	do	do	19.0	15.50	1.85	29 000
June 30....	do	do	do	21.0	18.80	2.28	43 000
July 17....	do	do	do	21.0	18.00	1.01	18 200
Aug. 4....	do	do	do	18.0	11.20	1.00	11 200
Aug. 17....	do	do	do	17.0	8.60	0.73	6 300
Sept. 10....	do	do	do	17.0	8.20	0.75	6 100
Sept. 24....	do	do	do	16.5	8.35	0.79	6 600
Oct. 19....	do	do	do	17.0	8.95	0.64	5 700
Oct. 29....	do	do	do	17.0	8.30	0.74	6 200
Dec. 10....	do	do	do	11.5	5.67	0.56	3 200
Mar. 12....	P. H. Daniells....	Buchanan Spring....	SE. 2-7-1-5....		2.42	0.79	0 007a
Jan. 19....	J. E. Caughey....	Drumm Creek....	NW. 18-7-3-5....	7.5			1 910
Feb. 8....	F. R. Steinberger....	do	do	7.0	1.70	0.77	1 310
Feb. 22....	do	do	do	8.0	1.60	0.86	1 380
Mar. 9....	do	do	do	8.0	1.65	0.76	1 260
Mar. 24....	P. H. Daniells....	do	do	7.0	2.00	0.90	1 800
April 7....	do	do	do	9.0	3.60	1.57	5 600
April 19....	do	do	do	12.0	7.40	1.78	13 200
May 5....	do	do	do	14.0	10.80	1.95	21 000
May 17....	W. R. McCaffrey...	do	do	14.0	11.65	1.79	20 000
June 1....	do	do	do	11.0	5.20	2.00	10 600
June 14....	do	do	do	11.5	5.33	2.05	10 900
June 26....	do	do	do	12.0	7.30	1.85	13 500
July 17....	do	do	do	10.5	4.05	1.42	5 800
Aug. 3....	do	do	do	10.0	3.80	1.56	5 900
Aug. 17....	do	do	do	10.0	3.90	1.22	4 800
Sept. 10....	do	do	do	10.0	2.40	1.00	2 400
Sept. 25....	do	do	do	9.5	2.95	0.93	2 800
Oct. 19....	do	do	do	9.5	3.65	0.89	3 200
Oct. 30....	do	do	do	9.5	3.37	0.96	3 200
Nov. 12....	do	do	do	10.0	4.68	0.67	3 100
Nov. 26....	do	do	do	10.0	4.70	0.61	2 900
Dec. 11....	do	do	do	9.5	3.07	0.66	2 040
Dec. 28....	do	do	do	9.0	3.30	0.60	1 990
Jan. 23....	F. R. Steinberger....	N. Fortier Spring....	SE. 17-7-1-5....				0 008a
Feb. 9....	do	do	do				0 001a
Feb. 25....	do	do	do				0 001a
Mar. 11....	P. H. Daniells....	do	do				0 008a
Mar. 20....	do	do	do				0 009a
April 8....	do	do	do				0 009a
April 21....	do	do	do				0 009a
May 6....	do	do	do				0 010a
May 19....	W. R. McCaffrey...	do	do				0 013a
June 5....	do	do	do				0 013a

a Weir measurement.  
b Bucket measurement.



## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Olman drainage basin, in 1915.

—Continued.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
June 19.....	W. R. McCaffrey..	N. Fortier Spring..	SE. 17-7-1-5.....				0.026b
July 8.....	do.....	do.....	do.....				0.059a
July 21.....	do.....	do.....	do.....				0.051a
Aug. 5.....	do.....	do.....	do.....				0.035a
Aug. 20.....	do.....	do.....	do.....				0.025a
Sept. 14.....	do.....	do.....	do.....				0.022a
Oct. 1.....	do.....	do.....	do.....				0.020a
Oct. 13.....	J. E. Caughey.....	do.....	do.....				0.021a
Jan. 9.....	F. R. Steinberger..	S. Fortier Spring..	do.....				0.005a
Feb. 9.....	do.....	do.....	do.....				0.004a
Feb. 25.....	do.....	do.....	do.....				0.004a
Mar. 11.....	P. H. Daniells.....	do.....	do.....				0.008a
Mar. 20.....	do.....	do.....	do.....				0.008a
April 8.....	do.....	do.....	do.....				0.008a
April 21.....	do.....	do.....	do.....				0.008a
May 6.....	do.....	do.....	do.....				0.006a
May 19.....	W. R. McCaffrey..	do.....	do.....				0.006a
June 5.....	do.....	do.....	do.....				0.008a
June 19.....	do.....	do.....	do.....				0.008a
July 6.....	do.....	do.....	do.....				0.008b
July 21.....	do.....	do.....	do.....				0.008b
Aug. 5.....	do.....	do.....	do.....				0.008b
Aug. 20.....	do.....	do.....	do.....				0.008b
Sept. 14.....	do.....	do.....	do.....				0.008b
Oct. 1.....	do.....	do.....	do.....				0.008b
Oct. 13.....	do.....	do.....	do.....				0.008b
Mar. 24.....	P. H. Daniells.....	Gold Creek.....	SE. 30-7-3-5.....	20.0	15.80	0.86	13.500
April 7.....	do.....	do.....	do.....	22.0	18.40	1.16	22.000
April 19.....	do.....	do.....	do.....	22.0	25.00	1.76	44.000
May 5.....	do.....	do.....	do.....	24.0	35.00	3.17	111.000
May 17.....	W. R. McCaffrey..	do.....	do.....	24.0	34.20	3.30	112.000
June 1.....	do.....	do.....	do.....	23.0	31.75	2.67	85.000
June 14.....	do.....	do.....	do.....	22.5	27.62	2.48	69.000
June 30.....	do.....	do.....	do.....	22.0	28.60	3.05	87.000
Aug. 4.....	do.....	do.....	do.....	22.0	26.55	2.85	76.000
Aug. 17.....	do.....	do.....	do.....	22.0	20.60	1.48	32.000
Sept. 10.....	do.....	do.....	do.....	21.0	18.95	1.42	27.000
Sept. 24.....	do.....	do.....	do.....	22.0	19.20	1.34	26.000
Oct. 19.....	do.....	do.....	do.....	22.0	17.00	1.37	23.000
Nov. 27.....	do.....	do.....	do.....	23.0	18.65	0.98	18.400
Dec. 28.....	do.....	do.....	do.....	20.0	15.20	0.96	14.700
Mar. 24.....	P. H. Daniells.....	Lyon Creek.....	SE. 35-7-4-5.....	10.0	4.05	1.28	5.200
April 7.....	do.....	do.....	do.....	17.0	12.60	1.96	24.000
April 19.....	do.....	do.....	do.....	22.0	17.40	3.18	54.000
May 5.....	do.....	do.....	do.....	23.0	26.00	3.04	79.000
May 18.....	W. R. McCaffrey..	do.....	do.....	23.0	29.50	5.14	152.000
June 1.....	do.....	do.....	do.....	16.0	10.40	1.44	15.000
June 30.....	do.....	do.....	do.....	18.0	13.80	1.84	25.000
Aug. 4.....	do.....	do.....	do.....	16.0	7.80	1.24	9.700
Aug. 16.....	do.....	do.....	do.....	9.0	4.00	1.04	4.200
Sept. 25.....	do.....	do.....	do.....	6.0	1.80	0.83	1.490
Oct. 18.....	do.....	do.....	do.....	8.5	4.33	0.75	3.300
Oct. 29.....	do.....	do.....	do.....	16.5	9.83	1.12	11.000
Dec. 11.....	do.....	do.....	do.....	13.0	9.00	0.39	3.540
Mar. 23.....	P. H. Daniells.....	Nez Percée Creek...	SE. 17-8-4-5.....	5.0	2.10	1.38	2.900
April 6.....	do.....	do.....	do.....	14.0	8.00	0.75	6.000
April 17.....	do.....	do.....	do.....	14.0	9.00	2.05	18.400
May 18.....	W. R. McCaffrey..	do.....	do.....	15.0	10.20	2.04	21.000
May 31.....	do.....	do.....	do.....	14.0	7.40	1.62	12.000
June 16.....	do.....	do.....	do.....	14.0	9.70	2.28	21.000
June 30.....	do.....	do.....	do.....	14.5	9.38	1.92	18.000
July 16.....	do.....	do.....	do.....	14.0	5.40	1.15	6.200
Aug. 4.....	do.....	do.....	do.....	16.0	10.00	2.06	20.000
Aug. 17.....	do.....	do.....	do.....	6.5	3.40	0.84	2.800
Sept. 9.....	do.....	do.....	do.....	4.5	2.04	1.22	2.500
Sept. 24.....	do.....	do.....	do.....	5.0	1.40	1.41	2.000
Oct. 29.....	do.....	do.....	do.....	6.0	1.90	0.79	1.510
Nov. 27.....	do.....	do.....	do.....	2.0	0.45	2.40	1.080
Dec. 27.....	do.....	do.....	do.....	2.5	0.50	0.82	0.410
May 31.....	do.....	Starr Creek.....	SW. 7-8-4-5.....	9.0	7.10	2.70	19.200
June 15.....	do.....	do.....	do.....	10.0	7.30	2.50	18.200
July 16.....	do.....	do.....	do.....	8.0	4.83	1.79	8.600
Mar. 24.....	P. H. Daniells.....	York Creek.....	NW. 34-7-4-5.....	15.0	4.75	0.51	2.430
April 7.....	do.....	do.....	do.....	20.0	11.80	1.19	14.000
April 19.....	do.....	do.....	do.....	24.0	21.00	2.48	52.000
May 5.....	do.....	do.....	do.....	25.0	22.00	2.91	64.000
May 17.....	W. R. McCaffrey..	do.....	do.....	24.0	20.80	2.82	58.000
June 1.....	do.....	do.....	do.....	20.0	16.60	2.24	37.000
June 26.....	do.....	do.....	do.....	27.0	26.10	2.91	76.000
July 17.....	do.....	do.....	do.....	13.0	13.55	1.11	15.000

a Weir measurement.

b Bucket measurement.

## SESSIONAL PAPER No. 25c

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Oldman drainage basin, in 1915.  
—Concluded.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Dis-charge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec. ft.</i>
Aug. 4....	R. W. McCaffrey..	York Creek.....	NW. 34-7-4-5....	18.0	11.90	1.10	13.000
Aug. 17....	do .....	do .....	do .....	13.5	9.53	0.70	6.700
Sept. 10....	do .....	do .....	do .....	8.5	4.83	1.05	5.100
Sept. 24....	do .....	do .....	do .....	9.0	4.95	1.11	5.500
Oct. 19....	do .....	do .....	do .....	9.0	4.65	0.76	5.500
Oct. 29....	do .....	do .....	do .....	8.0	4.70	1.05	5.000
Dec. 10....	do .....	do .....	do .....	5.5	2.15	1.98	4.230
Aug. 12....	R. H. Goodchild...	Canyon Creek....	NW. 5-12-28-4....				0.812a
Oct. 8....	G. H. Whyte and W. R. McCaffrey	Carbondale River..	SW. 14-6-3-5....	49.0	64.05	2.20	141.000
Oct. 7....	do .....	Castle River (W. Br.).....	NW. 16-5-3-5....	36.5	37.52	2.72	102.000
Oct. 8....	do .....	do .....	do .....	54.0	66.50	2.55	169.000
May 31....	W. R. McCaffrey..	Creek No. 1.....	SE. 12-8-5-5....	5.0	2.30	1.97	4.530
June 15....	do .....	do .....	do .....	5.0	2.16	2.40	5.200
July 16....	do .....	do .....	do .....	5.5	2.43	1.51	3.700
Aug. 7....	R. H. Goodchild...	Spring .....	Sec. 5-13-29-4....				0.180a

a Weir measurement.

## WATERTON RIVER DRAINAGE BASIN.

*General Description.*

Waterton River rises in the northwestern portion of the state of Montana, on the eastern slope of the Rocky Mountains. It flows in a northerly direction and, passing through a chain of lakes near the international boundary, known as Waterton Lakes, it continues in a north and easterly direction and finally empties into Belly River near Stand Off, Alberta.

The topography of the basin is of a varied character, ranging from the mountainous regions of Montana to the rolling prairie of southern Alberta. The tributaries are mostly in the upper portion of the basin, near the international boundary and from the west side.

There is a large snow-fall in the upper portion of the basin, and the melting of this combined with heavy rains often causes floods on this river in the early summer. Thereafter the river steadily decreases in volume, until the minimum is reached about mid-winter.

The names of the principal tributaries of this stream are, the Little Kootenay, which rises in Montana and empties into the south end of the Waterton Lakes; Boundary Creek, and East Boundary Creek, two small streams emptying into the upper Waterton Lake from the west and east slopes, are south of the international boundary; Hell Roaring Creek is a small stream in Canada, flowing into the upper Waterton Lake from the east slope; Bertha Creek is a small tributary mostly snow fed, from the west slope of the upper lake, and originating solely in Canada; Cameron, or Oil Creek, as it is called locally, has its head in Cameron Lake, a body of water divided by the international boundary; Blakiston Brook, a stream locally called Pass Creek, rises wholly in Canada, and is a steady source of supply to the waters of the Waterton River; Crooked Creek drains the northeast slope of Sheep Mountain and the nearby foothills and empties into Waterton River one mile below the lakes; Pine Creek, Yarrow Creek and Drywood River are the chief tributaries of the river system from foothills on the west slope.

## WATERTON RIVER AT WATERTON MILLS.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 8, Tp. 2, Rge. 29, W. 4th Mer., at Waterton Mills post office. Records available.—August 26, 1908, to December 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 4,153.07 feet during 1908-12. Zero of gauge maintained at 4,152.87 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark, located within six feet of the gauge. Elevation, 4,152.87 feet above mean sea level. (Irrigation Surveys datum.)

*Channel.*—Composed of rocks, stone and gravel; not liable to shift.

*Discharge measurements.*—Made from a cable car at ordinary stages and by wading at very low stages.

*Winter flow.*—The high velocity prevents a complete ice cover at the gauge during the winter and open water measurements are obtained.

*Observer.*—H. H. Hanson, Waterton Mills post office, Alberta.

*Remarks.*—With a view to obtaining more accurate measurements the cable was moved from the NE.  $\frac{1}{4}$  Sec. 8, Tp. 2, Rge. 29, W. 4th Mer., to SW.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 29, W. 4th Mer., in November, 1914. The channel at this point is straight for about 300 feet above and 300 feet below the cable. The bed of the stream consists of small stones and gravel and is not liable to shift.

During 1915, the high cut-bank, at the cable station, kept continually slipping and may weaken the anchorage.

DISCHARGE MEASUREMENTS of Waterton River at Waterton Mills, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 6.	O. H. Hoover.	126	231.0	0.67	2.44	155
Feb. 3.	W. A. Burton.	124	133.0	0.69	2.17	91
Feb. 17.	J. E. Degnan	88	89.8	1.01	2.16	90
Feb. 19.	do	86	88.5	0.96	2.13	85
Mar. 9.	do	94	90.0	0.80	2.05	71
April 10.	V. A. Newhall.	128	296.0	1.00	2.95	295
April 28.	do	143	446.6	1.76	3.55	776
May 3.	do	155	601.3	2.48	4.03	1,434
May 27.	do	152	543.0	2.28	3.85	1,206
May 31.	do	154	558.0	2.37	3.94	1,294
June 30.	do	157	615.0	2.62	4.12	1,548
July 22.	do	148	487.4	1.81	3.62	845
Aug. 10.	do	141	401.5	1.35	3.31	515
Aug. 25.	do	142	407.0	1.06	3.14	402
Sept. 22.	do	148	480.5	1.31	3.39	598
Oct. 13.	do	150	477.3	1.30	3.35	564
Nov. 18.	W. H. Story.	135	350.2	0.81	3.10	267a
Dec. 12.	do	134	334.4	0.74	2.70	231

a Slush ice possibly affected accuracy of measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Waterton River at Waterton Mills, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	2.41	136	2.20	98	2.08	79	2.51	157	3.74	1,006	3.94	1,294
2.	2.44	142	2.17	93	2.08	79	2.47	148	3.91	1,246	3.97	1,342
3.	2.43	140	2.19	96	2.08	79	2.58	175	4.01	1,406	4.04	1,454
4.	2.35	124	2.20	98	2.08	79	2.64	191	4.02	1,422	4.27	1,839
5.	2.36	126	2.18	95	2.08	79	2.69	205	4.00	1,390	4.40	2,070
6.	2.47	148	2.18	95	2.08	79	2.75	224	3.94	1,294	4.44	2,142
7.	2.35	124	2.17	93	2.07	77	2.92	289	3.91	1,246	4.42	2,106
8.	2.33	120	2.16	92	2.07	77	2.95	302	3.99	1,374	4.41	2,088
9.	2.30	114	2.16	92	2.05	74	3.04	346	4.18	1,686	4.34	1,962
10.	2.42	138	2.17	93	2.10	82	2.94	298	4.25	1,805	4.31	1,908
11.	2.35	124	2.18	95	2.10	82	2.99	320	4.30	1,890	4.25	1,805
12.	2.26	108	2.23	103	2.11	84	3.02	335	4.19	1,703	4.21	1,737
13.	2.05	74	2.19	96	2.10	82	3.03	341	4.21	1,737	4.16	1,652
14.	2.45	144	2.18	95	2.10	82	3.12	392	4.22	1,754	4.17	1,669
15.	2.26	108	2.18	95	2.14	88	3.19	438	4.17	1,669	4.19	1,703
16.	2.29	112	2.16	92	2.05	74	3.28	504	4.10	1,550	4.20	1,720
17.	2.25	106	2.15	90	2.14	88	3.34	556	4.04	1,454	4.22	1,754
18.	2.24	104	2.13	87	2.14	88	3.47	680	4.00	1,390	4.25	1,805
19.	2.22	101	2.13	87	2.11	84	3.55	765	3.93	1,278	4.25	1,805
20.	2.19	96	2.12	85	2.12	85	3.72	978	3.86	1,174	4.21	1,737
21.	2.19	96	2.12	85	2.13	87	3.73	992	3.91	1,246	4.15	1,635
22.	2.20	98	2.13	87	2.14	88	3.75	1,020	3.89	1,216	4.10	1,550
23.	2.15	90	2.13	87	2.19	96	3.73	992	3.75	1,020	4.06	1,486
24.	2.16	92	2.11	84	2.26	108	3.71	964	3.80	1,090	4.04	1,454
25.	2.17	93	2.11	84	2.27	109	3.65	885	3.83	1,132	4.07	1,502
26.	2.18	95	2.10	82	2.29	112	3.60	825	3.84	1,146	4.19	1,703
27.	2.25	106	2.14	88	2.32	118	3.57	789	3.85	1,160	4.16	1,652
28.	2.18	95	2.10	82	2.33	120	3.54	754	3.84	1,146	4.14	1,618
29.	2.19	96	.....	.....	2.35	124	3.53	743	3.90	1,230	4.13	1,601
30.	2.18	95	.....	.....	2.37	128	3.61	837	3.93	1,278	4.12	1,584
31.	2.17	93	.....	.....	2.40	134	.....	.....	3.94	1,294	.....	.....

NOTE.—Open water in January, February and March.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Waterton River at Waterton Mills, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	4.14	1,618	3.58	801	2.99	320	3.22	459	3.22	459	2.61	183
2.....	4.09	1,534	3.55	765	3.03	341	3.30	520	3.16	417	2.65	194
3.....	4.06	1,486	3.51	721	3.30	520	3.33	547	3.18	431	2.72	214
4.....	4.01	1,406	3.49	700	3.32	538	3.40	610	3.19	438	2.74	221
5.....	3.95	1,310	3.44	650	3.27	496	3.43	640	3.20	445	2.76	227
6.....	3.90	1,230	3.42	630	3.25	480	3.42	630	3.21	452	2.73	218
7.....	3.88	1,202	3.39	601	3.21	452	3.41	620	3.17	424	2.68	202
8.....	3.85	1,160	3.35	565	3.18	431	3.42	630	3.12	392	2.71	211
9.....	3.80	1,090	3.34	556	3.24	473	3.41	620	3.14	404	2.74	221
10.....	3.76	1,034	3.31	529	3.26	488	3.39	601	3.14	404	2.73	218
11.....	3.71	964	3.29	512	3.24	473	3.37	583	3.12	392	2.69	205
12.....	3.66	898	3.26	488	3.22	459	3.35	565	3.07	363	2.70	208
13.....	3.60	825	3.27	496	3.20	445	3.37	583	3.11	386	2.64 <sup>f</sup>	191
14.....	3.59	813	3.24	473	3.23	466	3.32	538	3.00	324	2.65	194
15.....	3.55	765	3.21	452	3.20	445	3.31	529	3.02	335	2.63	188
16.....	3.51	721	3.21	452	3.25	480	3.31	529	2.99	320	2.64	191
17.....	3.65	885	3.19	438	3.33	547	3.32	538	3.18	431	2.61	183
18.....	3.68	924	3.15	410	3.36	574	3.37	583	3.01	330	2.63	188
19.....	3.64	873	3.14	404	3.40	610	3.31	529	2.98	315	2.65	194
20.....	3.62	849	3.20	445	3.41	620	3.30	520	3.42	630	2.68	202
21.....	3.61	837	3.23	466	3.42	630	3.32	538	3.26	488	2.62	186
22.....	3.60	825	3.19	438	3.40	610	3.25	480	3.04	346	2.65	194
23.....	3.58	801	3.16	417	3.38	592	3.28	504	2.91	284	2.61	183
24.....	3.56	777	3.15	410	3.37	583	3.26	488	3.20	445	2.61	183
25.....	3.54	754	3.13	398	3.35	565	3.26	488	2.95	302	2.60	180
26.....	3.57	789	3.12	392	3.32	538	3.24	473	3.03	341	2.59	177
27.....	3.53	743	3.10	380	3.30	520	3.25	480	3.10	380	2.64	192
28.....	3.58	801	3.06	358	3.30	520	3.31	529	2.60	180	2.64	192
29.....	3.62	849	3.05	352	3.29	512	3.20	445	3.12	392	2.61	183
30.....	3.61	837	3.04	346	3.25	480	3.21	452	2.85	260	2.46	146
31.....	3.58	801	3.03	341	.....	.....	3.21	452	.....	.....	2.78	234

<sup>f</sup> New winter gauge rod installed.

Water open at gauge in November and December.

## MONTHLY DISCHARGE of Waterton River at Waterton Mills, for 1915.

(Drainage area 214 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	148	74	111	0 519	0 599	6,825
February.....	103	82	91	0 425	0 442	5,054
March.....	134	74	92	0 430	0 496	5,657
April.....	1,020	148	548	2 561	2 857	32,608
May.....	1,890	1,006	1,369	6 397	7 375	84,178
June.....	2,142	1,294	1,713	8 005	8 932	101,940
July.....	1,618	721	981	4 584	5 285	60,319
August.....	801	341	496	2 318	2 673	30,498
September.....	630	320	507	2 369	2 644	30,169
October.....	640	445	519	2 519	2 904	33,142
November.....	630	180	384	1 793	2 000	22,832
December.....	234	146	197	0 920	1 061	12,107
The year.....	.....	.....	.....	.....	37 267	425,319

## CROOKED CREEK NEAR WATERTON MILLS.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 22, Tp. 2, Rge. 29, W. 4th Mer.

*Records available.*—September 15, 1909, to October 8, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at elevation 89.48 feet during 1913-15. For previous gauge datum refer to previous reports.

*Bench-mark.*—Permanent iron bench-mark located on the left bank 25 feet from the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Consists of sand, gravel and small stones, not liable to shift.

*Discharge measurements.*—Made by wading.

*Winter flow.*—No records are taken during winter season.

*Observer.*—Frank Rowe.

## DISCHARGE MEASUREMENTS of Crooked Creek near Waterton Mills, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 8.....	V. A. Newhall.....	13.4	11.27	1.24	1.98	14.0
April 10.....	do.....	17.0	8.07	1.52	1.93	12.2
April 27.....	do.....	12.4	9.02	1.08	1.81	9.8
May 3.....	do.....	17.0	24.05	2.02	2.59	48.0
May 25.....	do.....	16.0	19.36	1.89	2.34	37.0
May 28.....	do.....	15.4	18.12	1.73	2.25	31.0
June 29.....	do.....	17.0	24.77	1.88	2.44	46.0
June 30.....	do.....	17.8	28.57	2.21	2.70	63.0
July 20.....	do.....	17.0	25.23	1.89	2.50	48.0
Aug. 12.....	do.....	15.5	15.20	1.49	2.11	23.0
Aug. 25.....	do.....	16.1	17.50	1.56	2.215	27.0
Sept. 11.....	do.....	17.0	25.46	1.90	2.52	48.0
Sept. 23.....	do.....	15.5	18.30	1.60	2.25	29.0
Oct. 13.....	do.....	17.7	28.07	2.03	2.58	57.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Crooked Creek near Waterton Mills, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec. ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.19	26.0	3.08	100	2.20	26
2.....			2.51	50.0	2.60	57	2.24	29
3.....			2.59	56.0	2.40	41	2.95	87
4.....			2.23	28.0	2.45	45	5.12	304
5.....			2.08	19.4	2.46	46	3.35	127
6.....			2.10	20.0	2.31	34	3.20	122
7.....			2.03	16.8	2.35	37	3.22	114
8.....			2.03	16.8	2.34	35	2.85	77
9.....			1.89	11.5	2.36	38	2.75	69
10.....			1.92	12.4	2.33	35	3.35	127
11.....			1.94	13.1	2.27	31	3.27	119
12.....			1.94	13.1	2.24	29	3.25	117
13.....			1.96	13.8	2.26	30	3.21	113
14.....			2.21	27.0	2.26	30	3.28	120
15.....			2.18	25.0	3.00	92	3.07	99
16.....	2.90	82.0	2.07	19.0	2.95	87	3.03	95
17.....	2.86	78.0	2.00	15.4	2.81	74	2.97	89
18.....	2.79	72.0	1.97	14.2	2.95	87	3.07	99
19.....	2.61	58.0	1.92	12.4	2.70	65	3.08	100
20.....	2.27	31.0	1.89	11.5	2.55	53	2.79	72
21.....	2.10	20.0	1.89	11.5	2.46	46	2.65	61
22.....	2.03	16.8	2.03	16.8	2.40	41	2.58	55
23.....	2.06	18.3	1.95	13.4	2.35	37	2.55	53
24.....	1.92	12.4	1.90	11.8	2.32	35	2.47	47
25.....	1.89	11.5	1.87	11.0	2.35	37	2.55	53
26.....	1.90	11.8	1.84	10.2	2.30	33	3.00	92
27.....	2.01	15.9	1.83	10.0	2.26	30	2.77	71
28.....	1.97	14.2	1.81	9.6	2.25	30	2.70	65
29.....	1.97	14.2	1.79	9.2	2.27	31	2.50	49
30.....	1.78	9.0	1.85	10.4	2.24	29	2.62	59
31.....	1.78	9.0			2.22	28		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Crooked Creek near Waterton Mills, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.35	127	3.00	92.0	1.96	13.8	2.25	30
2.....	2.92	84	2.85	77.0	2.17	25.0	2.21	27
3.....	2.75	69	2.70	65.0	2.76	70.0	2.50	49
4.....	2.61	58	2.47	47.0	2.56	54.0	2.60	57
5.....	2.59	56	2.39	40.0	2.33	35.0	2.51	50
6.....	2.51	50	2.33	35.0	2.20	26.0	2.54	52
7.....	2.52	51	2.30	33.0	2.12	22.0	2.48	47
8.....	2.48	47	2.22	28.0	2.11	21.0	2.52	51
9.....	2.38	39	2.22	28.0	2.75	69.0		
10.....	2.35	37	2.18	25.0	2.67	63.0		
11.....	2.29	32	2.14	24.0	2.54	52.0		
12.....	2.20	26	2.10	20.0	2.46	46.0		
13.....	2.20	26	2.13	22.0	2.38	39.0		
14.....	2.31	34	2.25	30.0	2.36	38.0		
15.....	2.22	28	2.25	30.0	2.40	41.0		
16.....	2.18	25	2.13	22.0	2.36	38.0		
17.....	2.37	39	2.12	22.0	2.29	32.0		
18.....	3.70	162	2.08	19.4	2.28	32.0		
19.....	2.80	73	2.06	18.3	2.34	36.0		
20.....	2.50	49	5.80	372.0	2.40	41.0		
21.....	2.40	41	2.85	77.0	2.33	35.0		
22.....	2.30	33	2.38	39.0	2.26	30.0		
23.....	2.26	30	2.28	32.0	2.24	29.0		
24.....	2.29	32	2.23	28.0	2.36	38.0		
25.....	2.25	30	2.18	25.0	2.34	36.0		
26.....	3.15	107	2.13	22.0	2.26	30.0		
27.....	2.75	69	2.12	22.0	2.34	36.0		
28.....	3.23	115	2.09	19.9	2.36	38.0		
29.....	3.10	102	2.05	17.8	2.31	34.0		
30.....	3.20	112	2.00	15.4	2.26	30.0		
31.....	3.13	105	1.97	14.2				

Observer discontinued observations after Oct. 8.

## MONTHLY DISCHARGE of Crooked Creek near Waterton Mills, for 1915.

(Drainage area 26 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (16-31).....	82.0	9.0	30.0	1.15	0.684	932
April.....	36.0	9.2	17.8	0.88	0.759	1,059
May.....	100.0	28.0	45.9	1.76	2.029	2,823
June.....	304.0	26.0	90.0	3.46	3.860	3,353
July.....	162.0	25.0	61.0	2.35	2.709	3,751
August.....	372.0	14.2	44.0	1.69	1.948	2,705
September.....	70.0	13.8	38.0	1.46	1.639	2,261
October (1-8).....	57.0	27.0	45.0	1.73	0.514	714
The period.....					14.132	19,619

## WATERTON RIVER NEAR STAND OFF.

Location.—On NW  $\frac{1}{4}$  Sec. 28, Tp. 6, Rge. 25, W. 4th Mer., about three-quarters of a mile below the bridge on the Macleod trail.

Records available.—November 5, 1915, to December 31, 1915.

Gauge.—Three sections of enamelled gauge rods from 0.0 ft. to 9.0 ft. attached to a 4'' x 4'' post braced by two, 2'' x 4'', posts. Zero maintained at elevation of 90.11 feet since establishment.



*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of boulders and gravel, nor likely to shift except when influenced by heavy flood conditions.

*Discharge measurements.*—Made from cable car.

*Winter flow.*—Measurements made under cable at regular station.

*Observer.*—E. Cuthbert Bellerby.

*Remarks.*—This station was established November 5, 1915, by V. A. Newhall.

# DISCHARGE MEASUREMENTS of Waterton River near Stand Off, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Nov. 5.....	V. A. Newhall.....	128	292.2	2.20	1.78	654
Dec. 3.....	W. H. Storey.....	123	224.7	1.66	1.44	375
Dec. 21.....	do.....	130	256.4	1.02	2.11	262

# DAILY GAUGE HEIGHT AND DISCHARGE of Waterton River near Stand Off, for 1915.

DAY.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.22	400
2.....			1.22	357
3.....			1.44	375
4.....			1.36	374
5.....	1.78 <sup>a</sup>	657	1.42	374
6.....	1.75	630	1.40	374
7.....	1.76	639	1.25	370
8.....	1.74	621	1.28	360
9.....	1.69	577	1.46	330
10.....	1.70	585	1.29	298
11.....	1.64	534	1.93	305
12.....	1.66	551	2.03 <sup>b</sup>	308
13.....	1.43	371	1.94	306
14.....	1.57	540	2.15	300
15.....	1.55	545	1.80	296
16.....	1.68	545	1.71	294
17.....	1.64	530	1.88	300
18.....	1.61	504	1.42	312
19.....	1.47	475	1.46	310
20.....	1.34	435	1.67	285
21.....	1.59	445	2.00	262
22.....	1.62	480	2.17	277
23.....	1.58	500	1.95	273
24.....	1.44	470	1.65	258
25.....	1.30	397	1.72	247
26.....	1.35	395	1.85	238
27.....	1.31	400	1.80	243
28.....	1.12	364	1.73	235
29.....	0.68	338	1.56	225
30.....	1.59	432	1.80	240
31.....			2.80 <sup>b</sup>	253

<sup>a</sup> Station established Nov. 5, 1915.

<sup>b</sup> to <sup>b</sup> River covered by ice.

Ice conditions from Nov. 14.



## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Waterton River near Stand Off, for 1915.

(Drainage area 740 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
November (3-30).....	657	338	498	0.673	0.65	25,676
December.....	400	223	303	0.409	0.47	18,631
The period.....					1.12	44,307

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Waterton River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
April 10.....	V. A. Newhall.....	Bertha Creek.....	Tp. 1-30-4.....	4.8	1.89	0.43	0.82
Feb. 18.....	J. E. Degnan.....	Blakiston Brook.....	36-1-30-4.....	22.0	13.60	1.19	16.20
April 10.....	V. A. Newhall.....	do.....	do.....	30.2	31.70	2.03	64.00
May 3.....	do.....	do.....	do.....	28.0	67.10	4.89	328.00
May 29.....	do.....	do.....	do.....	38.0	73.20	4.88	337.00
July 3.....	do.....	do.....	do.....	42.0	63.70	4.38	279.00
July 24.....	do.....	do.....	do.....	37.8	42.60	2.92	125.00
Aug. 11.....	do.....	do.....	do.....	34.9	33.20	2.55	85.00
Aug. 26.....	do.....	do.....	do.....	35.0	34.40	2.02	70.00
Sept. 15.....	do.....	do.....	do.....	37.0	40.70	2.89	117.00
Sept. 13.....	do.....	Boundary Creek.....	Glacier National Park.....	33.0	28.40	0.91	26.00
Sept. 13.....	do.....	East Boundary Creek.....	do.....	8.7	3.30	1.02	3.60
Feb. 18.....	J. E. Degnan.....	Cameron Creek.....	26-1-30-4.....	20.0	76.00	0.62	9.80
April 9.....	V. A. Newhall.....	do.....	do.....	31.5	41.40	1.01	42.00
May 1.....	do.....	do.....	do.....	44.0	74.50	2.38	178.00
May 29.....	do.....	do.....	do.....	39.5	59.90	3.42	204.00
July 3.....	do.....	do.....	do.....	51.0	70.60	2.27	161.00
July 24.....	do.....	do.....	do.....	37.5	41.40	1.95	81.00
Aug. 11.....	do.....	do.....	do.....	21.6	32.60	1.55	31.00
Aug. 26.....	do.....	do.....	do.....	23.7	28.70	1.26	36.00
Sept. 17.....	do.....	Cameron Creek.....	Near Cameron Lake.....	13.5	6.80	0.90	6.20
April 12.....	do.....	North Branch Cottonwood Creek.....	SW. 29-2-29-4.....	19.8	10.6	0.84	8.80
April 12.....	do.....	South Branch Cottonwood Creek.....	NW. 20-2-29-4.....	14.5	11.50	0.18	2.10
April 28.....	do.....	Cottonwood Creek.....	SW. 21-2-29-4.....	17.7	11.00	1.61	17.60
May 26.....	do.....	do.....	do.....	19.1	20.60	3.11	64.00
June 30.....	do.....	do.....	do.....	21.0	21.40	3.17	68.00
July 22.....	do.....	do.....	do.....	20.7	18.00	2.47	44.00
Jan. 6.....	O. H. Hoover.....	Crooked Creek.....	NE. 8-2-29-4.....	10.3	3.10	1.64	5.00
Feb. 3.....	W. A. Burton.....	do.....	do.....	12.5	4.88	0.72	3.53
April 28.....	V. A. Newhall.....	do.....	NW. 9-2-29-4.....	15.9	7.10	1.16	8.30
May 3.....	do.....	do.....	do.....	19.5	20.00	3.02	60.00
May 27.....	do.....	do.....	do.....	19.0	14.80	2.27	34.00
May 31.....	do.....	do.....	do.....	17.8	14.50	2.04	30.00
June 30.....	do.....	do.....	do.....	19.6	22.30	2.83	63.00
July 22.....	do.....	do.....	do.....	19.4	16.70	2.14	36.00
Aug. 10.....	do.....	do.....	do.....	19.1	14.00	2.11	30.00
Aug. 25.....	do.....	do.....	do.....	19.2	14.80	2.07	31.00
Sept. 22.....	do.....	do.....	do.....	18.9	15.30	2.02	31.00
Oct. 13.....	do.....	do.....	do.....	19.8	22.40	2.58	58.00
Nov. 18.....	do.....	do.....	do.....	17.0	10.60	1.66	17.70
Dec. 12.....	W. H. Storey.....	do.....	do.....	17.0	10.50	1.55	16.20
April 12.....	V. A. Newhall.....	Drywood River.....	NW. 17-4-29-1.....	23.6	18.50	1.30	24.00
April 29.....	do.....	do.....	do.....	29.0	26.00	1.90	51.00
July 23.....	do.....	do.....	do.....	32.6	35.50	2.46	87.00
April 10.....	do.....	Hell Roaring Creek.....	Tp. 1-30-4.....	10.1	2.40	0.45	1.08
Sept. 13.....	do.....	do.....	do.....	17.2	8.40	1.35	11.40
Sept. 13.....	do.....	Little Kootenay River.....	Glacier National Park.....	58.0	58.4	1.33	78.00
April 12.....	do.....	Pine Creek.....	SW. 21-3-29-4.....	17.7	8.1	1.36	10.20
April 29.....	do.....	do.....	do.....	16.1	6.7	1.11	8.40
July 23.....	do.....	do.....	do.....	24.3	16.5	1.66	27.00
April 12.....	do.....	Yarrow Creek.....	SE 8-4-29-4.....	26.1	23.3	1.25	29.00
April 29.....	do.....	do.....	do.....	32.2	32.3	1.90	62.00
July 23.....	do.....	do.....	do.....	35.5	43.8	2.58	113.00

## BELLY RIVER DRAINAGE BASIN.

*General Description.*

Belly River rises near Chief Mountain in northern Montana. The main stream is augmented on the United States side of the boundary line by Middle Fork and on the Canadian side by North Fork. From the junction with North Fork in Sec. 21, Tp. 1, Rge. 28, W. of the 4th Mer., the river flows in a winding northeasterly course until it joins the Oldman River in Sec. 27, Tp. 9, Rge. 23, W. of the 4th Mer. From this point the stream is now known as the Oldman River although it was formerly called the Belly River until it is joined by the Bow River and forms the South Saskatchewan River.

The topography of the basin is of the most varied character, ranging from the mountainous regions of Montana and the rolling prairie and foothills at the boundary to the level prairie. The upper tributaries drain a forested region; the main stream flows through a deep valley with many clumps of poplar on its banks.

There is an abundant snowfall in the upper portion of the basin, but the precipitation diminishes into semi-arid conditions near the junction with the Oldman River. At first Belly River is a comparatively clear stream, but soon after crossing the boundary line it gradually becomes turbid, especially at the times of high water. The greater portion of the sediment is caused by the washing away of banks and cutting of new channels. Freshets caused by melting snow and heavy rains are frequent in the summer. The maximum flow usually occurs in June or July and after that the flow gradually decreases until it reaches the minimum in January or February.

As yet very little use has been made of the water in this basin. In the upper regions, where water could easily be diverted, it is not required for irrigation purposes and farther downstream it would be an expensive undertaking. There are, however, some small private irrigation schemes diverting water from tributaries of the river.

The Alberta Railway and Irrigation Company has located and may construct a canal from Belly River to supply their irrigation system, if St. Mary River is found deficient. A survey and an estimate of the cost of this proposed canal were made by the Government during 1912, and a copy of the report of this survey may be seen in the report of the Commissioner of Irrigation for 1912. There are also feasible power sites in the upper regions which will no doubt be developed when there is a market.

## BELLY RIVER NEAR MOUNTAIN VIEW.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 5, Tp. 2, Rge. 28, W. 4th Mer., at John West's ranch.

*Records available.*—November 1, 1911, to December 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at elevation 4,344.90 feet during 1911–15.

*Bench-mark.*—Permanent iron bench-mark, located on the right bank at the station. Elevation, 4,356.74 feet above mean sea level. (Irrigation Surveys datum.)

*Channel.*—Composed of gravel and sand; not liable to shift, except during flood conditions, on account of the rocky control about 200 feet downstream.

*Discharge measurements.*—Made from a cable car for all open water measurements.

*Winter flow.*—Winter measurements are made about 100 feet above the cable.

*Observer.*—J. N. West, Mountain View post office, Alberta.

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## DISCHARGE MEASUREMENTS of Belly River near Mountain View, in 1915.

Date.	Engineer.	Width.	Area	Mean	Gauge	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 5	O. H. Hoover	53	121	0.62	2.04	76.
Feb. 2	W. A. Burton	50	125	0.47	1.88	59.
Feb. 17	J. E. Degnan	49	108	0.48	1.80	52.
Mar. 9	do	52	116	0.25	1.50	30.
April 8	V. A. Newhall	85	205	0.86	2.06	176.
April 27	do	88	222	1.34	2.37	298.
May 24	do	93	259	1.93	2.79	501.
June 1	do	95	268	2.08	2.88	557.
June 28	do	98	317	2.95	3.44	936.
July 19	do	94	258	1.94	2.84	500.
July 26	do	94	253	1.94	2.81	490.
Aug. 9	do	90	246	1.71	2.65	422.
Aug. 16	do	88	232	1.52	2.53	353.
Aug. 27	do	84	218	1.38	2.40	301.
Sept. 11	do	86	224	1.49	2.47	334.
Sept. 24	do	87	228	1.52	2.50	345.
Oct. 13	do	86	220	1.41	2.44	310.
Oct. 15	do	86	218	1.43	2.42	312.
Nov. 17	W. H. Storey	82	197	0.88	2.22	174.
Dec. 11	do	76	176	0.53	1.92	93.
Dec. 31	do	57	113	0.59	1.93	66.

## DAILY GAUGE HEIGHT AND DISCHARGE of Belly River near Mountain View, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-	Gauge	Dis-
	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.	Height.	charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.15 <sup>a</sup>	73	1.92	62	1.74	46	1.73	79	2.77	488	2.96	601
2	2.14	71	1.90	61	1.75	41	1.87	116	3.24	796	3.00 <sup>c</sup>	626
3	2.16	72	1.89	60	1.70	35	1.85	110	3.15	730	3.92	1,372
4	2.14	74	1.90	62	1.67	38	1.94	137	2.90	563	3.76	1,236
5	2.20	76	1.89	63	1.70	39	2.00	156	2.86	540	3.83	1,292
6	2.18	76	1.87	63	1.64	38	2.04	169	2.70	450	3.64	1,120
7	2.24	76	1.85	60	1.45	35	2.03	166	2.77	488	3.60	1,076
8	2.15	76	1.85	60	1.72	31	2.01	159	3.00	626	3.37 <sup>c</sup>	874
9	2.14	76	1.83	60	1.75	29	2.00	156	3.22	781	3.40	898
10	2.12	76	1.81	60	1.79	32	2.00	156	3.32	858	3.44	932
11	2.10	76	1.72	55	1.78	32	2.00	156	3.33	867	3.30	818
12	2.01	76	1.60	53	1.80	33	2.00	156	3.20	766	3.28	802
13	1.84	77	1.78	54	1.79	34	2.15	206	3.12	708	3.26	787
14	2.11	77	1.85	47	1.70	33	2.20	224	3.28	827	3.24	771
15	2.10	77	1.85	51	1.65	32	2.30	264	3.14	721	3.40	898
16	1.87	78	1.79	53	1.68	32	2.48	341	3.00	626	3.44	932
17	2.00	79	1.79	53	1.68 <sup>a</sup>	32	2.40	304	2.95	594	3.53	1,008
18	2.08	79	1.78	54	1.76 <sup>b</sup>	86	2.55	375	2.94	588	3.55	1,025
19	2.00	79	1.79	55	1.74	82	2.65	425	2.84	528	3.50	983
20	1.98	79	1.75	55	1.71	74	2.74	472	2.76	483	3.34	850
21	1.83	77	1.76	55	1.72	77	2.70	450	2.70	450	3.36	787
22	1.74	67	1.75	56	1.66	63	2.65	425	2.65	425	3.31	748
23	2.14	62	1.75	57	1.68	68	2.54	370	2.74	472	3.30	818
24	2.13	69	1.80	57	1.67	65	2.51	355	2.80	505	3.20	740
25	1.96	74	1.84	57	1.68	68	2.46	332	2.83	522	3.65	1,112
26	1.93	72	1.75	56	1.65	61	2.40	304	2.85	534	3.58	1,031
27	1.94	62	1.64	53	1.60 <sup>a</sup>	50	2.38	296	2.90	563	3.60	1,068
28	1.96	51	1.69	50	1.67	65	2.35	284	2.97	607	3.53	1,008
29	1.94	60	1.68	50	1.68	68	2.34	280	2.95	594	3.45	940
30	1.94	62	1.67	50	1.67	65	2.67	435	2.94	588	3.36 <sup>b</sup>	866
31	1.90	63	1.68	50	1.74	82	2.68	435	2.95	594	3.36	866

a to a Ice conditions.

b to b Open water conditions.

c to c Period of shifting section.

DAILY GAUGE HEIGHT AND DISCHARGE of Belly River near Mountain View, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	3.47 <sup>b</sup>	957	2.91	546	2.30	260	2.36	284	2.33 <sup>d</sup>	272	2.04	126
2.	3.51	991	2.88	529	2.56	370	2.53	356	2.31	264	2.13	133
3.	3.35	858	2.84	507	2.50	343	2.76	465	2.29	256	2.18	136
4.	3.23	763	2.78	475	2.50	343	2.75	475	2.27	249	2.13	140
5.	3.24	771	2.70	435	2.50	343	2.71	440	2.27	249	1.93	140
6.	3.25	779	2.68	426	2.52	352	2.65	412	2.27	249	2.08	138
7.	3.18	726	2.68	426	2.50	343	2.58	379	2.25	242	2.08	132
8.	3.11	676	2.67	421	2.50	343	2.56	370	2.23	234	2.11	118
9.	3.09	662	2.65	412	2.70	435	2.52	352	2.22	230	2.18	106
10.	3.04	629	2.65	412	2.73	450	2.50	343	2.19	220	2.12	98
11.	3.00	602	2.62	397	2.47	330	2.47	330	2.19	220	1.92	92
12.	2.88	529	2.61	393	2.40	300	2.47	330	2.10	188	2.10	88
13.	2.85	512	2.60	388	2.34	276	2.44	317	2.03	166	2.20	86
14.	2.80	485	2.57	374	2.30	260	2.43	313	2.09	182	2.27	85
15.	2.75	460	2.54	361	2.29	256	2.43	313	2.27	249	2.17	85
16.	2.74	455	2.53	356	2.30	260	2.43	313	2.03 <sup>b</sup>	166	2.27	86
17.	2.92	552	2.51	348	2.30	260	2.42	309	2.22 <sup>a</sup>	174	2.32	88
18.	3.00	602	2.50	343	2.30	260	2.41	304	2.41	174	2.27	89
19.	2.82	496	2.49	339	2.84	507	2.40	300	2.38	173	2.37	92
20.	2.82	496	2.55	366	2.80	485	2.38	292	1.98	173	2.37	93
21.	2.79	480	2.51	348	2.60	388	2.36	284	1.92	173	2.32	93
22.	2.80	485	2.47	330	2.50	343	2.35	280	1.93	173	2.42	92
23.	2.80	485	2.46	326	2.61	393	2.35	280	2.03	173	2.27	87
24.	2.79	480	2.45	321	2.48	334	2.35	280	2.08	172	2.27	79
25.	2.77	470	2.44	317	2.45	321	2.34	276	2.02	167	2.47	77
26.	2.81	490	2.42	309	2.42	309	2.34	276	2.09	161	2.37	83
27.	3.00	602	2.41	304	2.40	300	2.34	276	2.09	152	2.37	84
28.	2.93	559	2.40	300	2.37	288	2.35	280	2.05	131	2.37	77
29.	3.00	602	2.39	296	2.36	284	2.35	280	2.05	124	2.37	66
30.	2.97	583	2.38	292	2.36	284	2.35	280	2.09	124	2.47	61
31.	3.00	602	2.35	280			2.34	276			1.93 <sup>a</sup>	66

*a* to *a* Ice conditions.*b* to *b* Open water conditions.*d* Estimated gauge height.

## MONTHLY DISCHARGE of Belly River near Mountain View, for 1915.

(Drainage area 121 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.	79	51	72	0.595	0.69	4,427
February.	63	47	56	0.463	0.48	3,110
March.	86	29	51	0.421	0.49	3,136
April.	472	79	262	2.157	2.41	15,590
May.	867	425	609	5.033	5.80	37,446
June.	1,372	601	934	7.719	8.61	55,577
July.	991	455	608	5.025	5.79	37,384
August.	546	280	376	3.107	3.58	23,119
September.	507	256	334	2.760	3.08	19,874
October.	475	276	325	2.686	3.10	19,983
November.	272	124	196	1.620	1.81	11,663
December.	140	61	97	0.804	0.93	5,983
The year.					36.77	237,292

SESSIONAL PAPER No. 25c

MAMI CREEK AT MOUNTAIN VIEW.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 19, Tp. 2, Rge. 27, W. 4th Mer.

*Records available.*—August 13, 1909, to October 31, 1915.

*Gauge.*—Vertical staff on bridge pier. Zero of gauge maintained at elevation 93.06 during 1909-1915.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of stones covered with sand and gravel not liable to shift, except in high floods.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Records are discontinued during winter season.

*Observer.*—C. H. Findlay, Mountain View, Alta.

DISCHARGE MEASUREMENTS of Mami Creek at Mountain View, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 7.....	V. A. Newhall.....	12.9	7.25	1.49	2.35	10.8
April 26.....	do.....	11.9	5.26	1.11	2.19	5.8
May 24.....	do.....	14.5	12.74	1.85	2.53	24.0
June 28.....	do.....	27.5	32.68	1.75	2.45	58.0
July 19.....	do.....	27.5	27.97	1.72	2.34	48.0
Aug. 9.....	do.....	27.3	21.25	1.08	2.05	23.0
Aug. 28.....	do.....	15.0	10.54	1.23	1.84	13.0
Sept. 10.....	do.....	17.0	14.18	1.64	2.05	23.0
Sept. 24.....	do.....	17.0	12.78	1.56	1.97	20.0
Oct. 12.....	do.....	19.2	17.06	1.93	2.21	33.0
Oct. 15.....	do.....	18.8	17.47	2.32	2.23	41.0

DAILY GAUGE HEIGHT AND DISCHARGE of Mami Creek at Mountain View, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.57	28.0	2.77	50.0	2.34	10.5
2.....			2.55	26.0	2.60	31.0	2.41	14.1
3.....			2.53	24.0	2.56	27.0	4.30c	244.0
4.....			2.50	21.0	2.50	21.0	3.25	124.0
5.....			2.48	19.4	2.52	23.0	3.15	125.0
6.....			2.47	18.5	2.45	16.9	3.08	123.0
7.....			2.43	15.5	2.40	13.5	3.02	122.0
8.....			2.40	13.5	2.35	10.9	2.95c	109.0
9.....			2.36	11.4	2.33	10.1	3.60	174.0
10.....			2.31	9.4	2.32	9.8	3.30	145.0
11.....			2.28	8.3	2.30	9.0	3.22	137.0
12.....			2.28	8.3	2.28	8.3	3.02	116.0
13.....			2.28	8.3	2.23	7.3	3.10	124.0
14.....			2.28	8.3	2.72	44.0	3.20	135.0
15.....			2.41	14.2	2.95	71.0	3.10	124.0
16.....			2.39	13.0	2.85	59.0	3.07	121.0
17.....			2.36	11.4	2.78	51.0	3.10	124.0
18.....			2.32	9.8	3.85	59.0	3.39	164.0
19.....			2.29	8.7	2.75	48.0	3.35	150.0
20.....			2.25	7.3	2.70	42.0	2.65	79.0
21.....			2.24	7.0	2.65	36.0	2.55	68.0
22.....			2.22	6.5	3.60	31.0	2.45	58.0
23.....			2.21	6.3	3.57	28.0	2.37	60.0
24.....			2.21	6.3	2.54	25.0	2.35	39.0
25.....			2.21	6.3	2.54	25.0	3.30	145.0
26.....			2.19	5.8	2.47	18.5	2.65	79.0
27.....			2.18	5.5	2.45	16.9	2.65	79.0
28.....	2.67	39	2.16	5.0	2.42	14.9	2.84	67.0
29.....	2.66	38	2.20	6.0	2.42	14.9	2.35	48.0
30.....	2.65	36	2.60	31.0	2.40	13.5	2.35	48.0
31.....	2.60	31			2.38	12.5		

c to c Shifting conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Mami Creek at Mountain View, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.35	48.0	2.55	68.0	1.75	9.6	1.73	8.9
2.....	2.35	48.0	2.37	50.0	1.90	15.6	1.90	15.6
3.....	2.35	48.0	2.34	47.0	2.30	44.0	1.95	17.9
4.....	2.25	39.0	2.30	44.0	2.15	30.0	2.05	24.0
5.....	2.15	30.0	2.15	30.0	2.00	20.0	2.05	24.0
6.....	2.08	25.0	2.10	27.0	1.85	13.4	2.10	27.0
7.....	2.08	25.0	2.10	27.0	1.79	11.0	2.10	27.0
8.....	2.12	28.0	2.00	20.0	1.75	9.6	2.10	27.0
9.....	2.15	30.0	1.98	19.5	1.88	14.7	2.10	27.0
10.....	2.10	27.0	1.90	15.6	2.05	24.0	2.05	24.0
11.....	2.00	20.0	1.90	15.6	2.00	20.0	2.15	30.0
12.....	1.99	20.0	1.98	19.5	2.00	20.0	2.20	34.0
13.....	1.99	20.0	1.98	19.5	2.00	20.0	2.15	30.0
14.....	2.00	20.0	1.98	19.5	2.00	20.0	2.25	39.0
15.....	1.99	20.0	1.98	19.5	1.97	18.9	2.27	41.0
16.....	1.99	20.0	1.94	17.4	1.95	17.9	2.30	44.0
17.....	2.75	89.0	1.91	16.1	1.85	13.4	2.25	39.0
18.....	2.70	84.0	1.89	15.2	1.83	12.6	2.10	27.0
19.....	2.34	47.0	1.85	13.4	1.83	12.6	2.10	27.0
20.....	2.50	63.0	3.00	114.0	1.83	12.6	2.10	27.0
21.....	2.09	26.0	2.35	48.0	1.83	12.6	2.05	24.0
22.....	1.90	15.6	2.20	34.0	1.83	12.6	2.05	24.0
23.....	2.00	20.0	2.05	24.0	1.82	12.2	2.00	20.0
24.....	2.10	27.0	2.05	24.0	1.97	18.9	1.97	18.9
25.....	2.10	27.0	2.05	24.0	1.96	18.4	1.95	17.9
26.....	2.79	93.0	1.99	20.0	1.92	16.5	1.95	17.9
27.....	2.50	63.0	1.94	17.4	1.87	14.3	1.93	17.0
28.....	2.70	84.0	1.96	18.4	2.00	20.0	1.91	16.1
29.....	2.65	79.0	1.91	16.1	1.91	16.1	1.90	15.6
30.....	2.50	63.0	1.85	13.4	1.75	9.6	1.90	15.6
31.....	2.45	58.0	1.80	11.4	.....	.....	1.89	15.2

## MONTHLY DISCHARGE of Mami Creek at Mountain View, for 1915.

(Drainage area 22 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (28-31).....	39.0	31.0	36.0	1.64	0.244	285
April.....	28.0	5.0	12.3	0.56	0.625	732
May.....	71.0	7.3	27.4	1.25	1.441	1,685
June.....	244.0	10.5	104.5	4.75	5.300	6,218
July.....	93.0	15.6	42.1	1.91	2.202	2,588
August.....	114.0	11.4	28.0	1.27	1.464	1,722
September.....	44.0	9.6	17.0	0.77	0.859	1,012
October.....	44.0	8.9	24.6	1.12	1.291	1,513
The period.....	.....	.....	.....	.....	13.426	15,755

## SESSIONAL PAPER No. 25c

## CHRISTIANSON DITCH NEAR MOUNTAIN VIEW.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 12, Tp. 3, Rge. 28, W. 4th Mer.

*Records available.*—May 17, to July 1, 1913. One discharge measurement only in 1914. Ditch not used in 1915.

*Gauge.*—Vertical staff. Elevation of zero, 96.04 feet.

*Bench-mark.*—Wooden stake, left bank. Assumed elevation, 100.00 feet.

*Observer.*—No observations in 1914 or 1915.

## BELLY RIVER NEAR STAND OFF.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 21, Tp. 6, Rge. 25, W. 4th Mer., near Stand Off.

*Records available.*—May 27, 1909, to December 31, 1915.

*Gauge.*—Chain gauge from bank. Zero of gauge maintained at 92.51 during 1909-12. Zero of gauge maintained at 91.82 during 1913. Zero of gauge maintained at 90.82 during 1914-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of clean gravel and small stone; not liable to shift.

*Discharge measurements.*—Made by wading at low stages and from the traffic bridge on the NE.  $\frac{1}{4}$  Sec. 21, Tp. 6, Rge. 25, W. 4th Mer. at high stages.

*Winter flow.*—Measurements through the ice are made at a point 150 feet below the chain gauge.

*Observer.*—George Pearson.

## DISCHARGE MEASUREMENTS of Belly River near Stand Off, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 8.....	O. H. Hoover.....	36	50.0	1.54	1.62	77
Jan. 29.....	W. A. Burton.....	34	40.0	1.41	1.52	56
Feb. 22.....	J. E. Degnan.....	34	40.6	1.38	1.62	56
Mar. 12.....	do.....	34	39.0	1.46	1.87	57
Mar. 31.....	do.....	83	121.0	1.29	2.28	155
April 14.....	V. A. Newhall.....	85	134.0	1.53	2.44	204
May 20.....	do.....	92	224.4	2.97	3.25	668
June 8.....	do.....	94	302.8	4.27	3.98	1,295
July 7.....	do.....	92	255.7	3.40	3.55	870
Aug. 2.....	do.....	86	254.9	3.37	3.47	860
Aug. 23.....	do.....	88	207.0	2.54	3.05	527
Sept. 29.....	do.....	87	171.9	2.09	2.82	359
Nov. 6.....	do.....	87	161.6	1.88	2.73	304
Dec. 2.....	W. H. Storey.....	86	146.8	0.92	2.22	136
Dec. 20.....	do.....	86	73.2	0.65	1.83	48



## DAILY GAUGE HEIGHT AND DISCHARGE of Belly River near Stand Off, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.66 <sup>a</sup>	79	1.55	55	1.62	51	2.26	154	3.04	478	3.19	577
2.....	1.66	82	1.55	58	1.63	50	2.27	157	3.43	762	3.19	577
3.....	1.67	82	1.55	60	1.65	49	2.30	164	3.45	780	3.18	570
4.....	1.67	80	1.57	62	1.65	49	2.35	179	3.30	658	4.79	2,208
5.....	1.68	77	1.58	61	1.68	49	2.44	207	3.34	689	4.59	1,974
6.....	1.66	75	1.58	58	1.70	50	2.42	200	2.97	437	4.45	1,813
7.....	1.64	75	1.58	56	1.70	50	2.41	197	2.93	413	4.09	1,410
8.....	1.64	77	1.58	54	1.70	50	2.40	194	3.04	478	3.98	1,294
9.....	1.69	77	1.58	54	1.70	51	2.39	191	3.38	720	3.85	1,160
10.....	1.67	76	1.58	55	1.70	52	2.39	191	3.46	789	4.24	1,574
11.....	1.63	74	1.58	56	1.72	54	2.39	191	3.54	861	4.19	1,519
12.....	1.60	72	1.56	58	1.82	56	2.39	191	3.62	935	4.03	1,346
13.....	1.60	70	1.54	59	1.83	60	2.42	200	3.69	1,001	3.80	1,110
14.....	1.65	68	1.49	60	2.70 <sup>d</sup>	65	2.49	223	3.71	1,020	4.15	1,475
15.....	1.65	66	1.52	59	3.66 <sup>d</sup>	71	2.60	262	3.92	1,231	4.17	1,497
16.....	1.65	65	1.58	57	4.62 <sup>d</sup>	80	2.60	262	3.73	1,040	4.25	1,585
17.....	1.63	64	1.65	55	5.58	89	2.65	282	3.57	888	4.05	1,368
18.....	1.60	63	1.71	55	6.08	99	2.76	328	3.41	745	4.02	1,336
19.....	1.57	62	1.75	55	5.63	108	2.84	366	3.33	681	4.88	2,316
20.....	1.54	60	1.78	55	4.08	116	3.00	454	3.24	614	4.13	1,453
21.....	1.52	59	1.79	56	3.37 <sup>a</sup>	121	3.00	454	3.17	563	3.60	916
22.....	1.50	58	1.72	56	2.42 <sup>b</sup>	200	3.10	514	3.06	490	3.60	916
23.....	1.48	58	1.71	57	2.38	188	3.00	454	3.02	466	3.65	963
24.....	1.35	58	1.69	57	2.35	179	2.90	396	3.02	466	3.69	1,001
25.....	1.44	58	1.69	56	2.33	173	2.82	356	3.14	542	3.76	1,070
26.....	1.46	57	1.69	56	2.33	173	2.70	302	3.14	542	5.20	2,700
27.....	1.48	56	1.68	55	2.28	159	2.66	286	3.10	514	4.93	2,376
28.....	1.52	56	1.64	54	2.25	152	2.65	282	3.11	521	4.24	1,574
29.....	1.54	56	.....	.....	2.23	147	2.65	282	3.18	570	3.93	1,242
30.....	1.54	56	.....	.....	2.24	150	2.73	315	3.18	570	3.80 <sup>b</sup>	1,110
31.....	1.54	55	.....	.....	2.26	154	.....	.....	3.19	577	.....	.....

<sup>a</sup> to <sup>a</sup> Ice conditions.<sup>b</sup> to <sup>b</sup> Open water conditions.<sup>d</sup> Estimated gauge height.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Belly River near Stand Off, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4.18	1,508	3.56	879	2.70	302	..... <sup>a</sup>	360	2.76	328	2.26 <sup>d</sup>	141
2	4.05	1,368	3.43	762	2.80	346	.....	380	2.75	324	2.22	136
3	3.96	1,273	3.31	666	3.90	1,210	.....	399	2.76	328	2.23	133
4	3.89	1,200	3.24	613	3.60	916	.....	471	2.71	306	..... <sup>b</sup>	132
5	3.65	923	3.18	570	3.56	879	..... <sup>a</sup>	580	2.72	311	.....	132
6	3.60	916	3.15	549	3.12	528	3.33	681	2.73 <sup>b</sup>	315	.....	132
7	3.55	870	3.05	484	3.09	508	3.33	681	2.73 <sup>c</sup>	293	.....	132
8	3.51	833	3.05	484	3.03	472	3.31	666	2.72	283	.....	130
9	3.47	798	3.01	460	2.91	402	..... <sup>a</sup>	590	2.72	273	.....	129
10	3.43	762	2.98	442	2.90	396	.....	500	2.72	262	.....	124
11	3.34	689	2.98	442	2.90	396	.....	467	2.73	250	.....	95
12	3.32	674	2.96	431	2.90	396	.....	458	2.75	240	.....	78
13	3.30	658	2.96	431	2.84	366	.....	445	2.77	233	.....	76
14	2.98	442	2.94	419	2.78	337	.....	445	2.75	232	.....	75
15	2.98	442	2.94	419	2.78	337	.....	432	2.73	230	.....	72
16	2.98	442	2.94	419	2.78	337	.....	428	2.74	230	.....	69
17	3.00	454	2.94	419	2.77	333	.....	428	2.72	232	.....	65
18	3.78	1,090	2.94	419	2.75	324	.....	428	2.71	230	.....	60
19	3.54	861	2.89	391	2.98	442	.....	424	2.69	230	.....	54
20	3.38	720	4.70	2,100	2.98	442	.....	419	2.68	223	1.83	48
21	3.29	651	4.10	1,420	2.99	448	.....	400	2.62	212	..... <sup>b</sup>	47
22	3.15	549	3.98	1,294	2.99	448	.....	375	2.60	207	.....	47
23	3.15	549	3.04	478	2.97	437	.....	350	2.58	207	.....	46
24	3.15	549	3.04	478	2.96	431	.....	345	2.53	207	.....	46
25	3.15	549	3.00	454	2.87 <sup>a</sup>	381	.....	345	2.48	206	.....	46
26	3.15	549	2.91	402	2.80	346	.....	345	2.46	203	.....	46
27	3.29	651	2.80	346	2.80	346	.....	340	2.43	200	.....	45
28	4.39	1,744	2.74	320	2.81	351	.....	340	2.40	190	.....	45
29	4.56	1,939	2.74	320	2.82	356	.....	340	2.36 <sup>d</sup>	173	.....	45
30	3.91	1,220	2.74	320	2.77	333	..... <sup>a</sup>	340	2.31 <sup>d</sup>	152	.....	45
31	3.75	1,070	2.70	302	.....	.....	2.77	333	.....	.....	.....	45

<sup>a</sup> to <sup>a</sup> No gauge heights available; discharges are estimated from those at West s Ranch.<sup>b</sup> to <sup>b</sup> No gauge heights available; discharges are estimates under ice conditions.<sup>d</sup> Estimated gauge height.

## MONTHLY DISCHARGE of Belly River near Stand Off, for 1915.

(Drainage area 461 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	82	55	67	0.145	0.17	4,120
February	62	54	57	0.124	0.13	3,166
March	200	49	100	0.217	0.25	6,149
April	514	154	274	0.594	0.66	6,304
May	1,231	413	679	1.472	1.70	41,750
June	2,700	570	1,401	3.039	3.39	83,305
July	1,939	442	870	1.887	2.18	53,494
August	2,100	302	578	1.254	1.44	55,540
September	1,210	302	452	0.980	1.09	26,896
October	681	333	437	0.948	1.09	26,870
November	328	153	244	0.529	0.59	14,519
December	141	45	81	0.176	0.20	4,980
The year					12.89	307,093

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Belly River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
Aug. 14....	V. A. Newhall....	South Branch of Belly River.....	Glacier National Park.....	59.5	65.8	1.76	116
Aug. 14....	do	Middle Branch of Belly River.....	do	50.0	52.2	2.72	146
Aug. 16....	do	South Fork of North Branch of Belly River.....	Waterton Park....	24.5	26.5	1.21	33
Aug. 16....	do	North Fork of North Branch of Belly River.....	do	31.5	14.9	1.48	22

## ST. MARY RIVER DRAINAGE BASIN.

*General Description.*

St. Mary River, an important tributary of the Oldman River and thus indirectly of the South Saskatchewan River, heads in northern Montana on the eastern slope of the main range of the Rocky Mountains. It starts from the great Blackfoot glacier and receives affluents from numerous lesser glaciers. These streams unite within a short distance from their source and flow into Upper St. Mary Lake. Below this lake and in close proximity, is Lower St. Mary Lake, the aggregate lengths of the two being about 22 miles. The river flows out of the lower lake, at an elevation of 4,460 feet above mean sea level, and takes a northerly course through the foothills to the international boundary. From the boundary it flows in a north and easterly direction through a rolling country, finally emptying into the Oldman River near Lethbridge, Alta.

The basin is bounded on the south by the Rocky Mountains, on the west by the watershed between Belly and St. Mary Rivers and on the east by the watershed between Milk and St. Mary Rivers. The upper portion of the basin is heavily timbered and receives a large precipitation mostly in the shape of snowfall; the lower and major portion is totally devoid of tree growth and has a small precipitation.

The river flows through a very deep valley having steep banks making the diversion of water from this stream for irrigation an expensive undertaking. In Canada the Alberta Railway and Irrigation Company has water rights on this river. The headgates of their canal are at Kimball, five miles north of the boundary, and they already have many miles of ditch constructed, which irrigates land surrounding Lethbridge.

As this is an international river, discharge measurements are taken on it by both the Canadian and American governments. The engineers of both countries use a common gauging station near Kimball.

## FIDLER BROTHERS' DITCH FROM BOUNDARY CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 19, Tp. 1, Rge. 26, W. 4th Mer.

*Records available.*—September 13, 1911, to July 13, 1914. Ditch not used in 1915.

*Gauge.*—Vertical staff.

*Bench-mark.*—Wooden plug on the left bank 8 feet west of the gauge. Elevation, 3.90 feet above zero of the gauge.

*Channel.*—Consists of sand and clay.

*Discharge measurements.*—Made by current-meter.

*Observer.*—Jos. Fidler.

## BOUNDARY CREEK AT FIDLER BROTHERS' RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 20, Tp. 1, Rge. 26, W. 4th Mer.

*Records available.*—June 18, 1913, to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 96.98 feet during 1913. Zero of gauge maintained at 95.06 feet during 1914-15.

*Bench-mark.*—Permanent iron bench-mark located 25 feet from edge of left bank, and 20 feet downstream from the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Consists of fine gravel, stone and clay; not liable to shift.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Records are discontinued during the winter season.

*Observer.*—James Fidler, Boundary Creek post office, Alta.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Boundary Creek at Fidler Brothers' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 26.....	V. A. Newhall.....	12.5	11.34	1.10	1.70	12.4
June 22.....	do.....	16.2	21.93	2.70	2.27	59.0
July 10.....	do.....	16.0	19.16	2.16	2.14	41.0
Aug. 7.....	do.....	16.3	18.77	1.94	2.07	36.0
Sept. 8.....	do.....	16.2	16.35	1.21	1.91	19.8
Oct. 18.....	do.....	16.2	17.16	1.47	2.00	25.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Boundary Creek at Fidler Brothers' Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.76	14.3	2.04	29.0	1.86	18.2
2.....			1.78	15.0	2.07	32.0	1.94	22.0
3.....			1.79	15.4	2.05	30.0	2.33	68.0
4.....			1.80	15.7	2.04	29.0	3.50	277.0
5.....			1.82	16.5	2.04	29.0	2.58	111.0
6.....			1.84	17.3	2.02	28.0	2.44	86.0
7.....			1.84	17.3	1.98	25.0	2.44	86.0
8.....			1.86	18.2	1.96	24.0	2.42	83.0
9.....			1.86	18.2	1.93	22.0	2.40	79.0
10.....			1.86	18.2	1.90	20.0	2.53	102.0
11.....			1.86	18.2	1.88	19.1	2.56	108.0
12.....			1.86	18.2	1.86	18.2	2.56	108.0
13.....			1.85	17.7	1.84	17.3	2.44	86.0
14.....			1.85	17.7	2.11	36.0	2.42	83.0
15.....			1.85	17.7	2.15	41.0	2.46	90.0
16.....			1.84	17.3	2.10	35.0	2.58	111.0
17.....			1.84	17.3	2.10	35.0	2.58	111.0
18.....	1.89	19.5	1.83	16.9	2.14	40.0	2.54	104.0
19.....	1.88	19.1	1.82	16.5	2.15	41.0	2.52	101.0
20.....	1.90	20.0	1.80	15.7	2.11	36.0	2.38	76.0
21.....	1.90	20.0	1.79	15.4	2.08	33.0	2.26	57.0
22.....	1.90	20.0	1.78	15.0	2.06	31.0	2.28	60.0
23.....	1.89	19.5	1.76	14.3	2.04	29.0	2.24	54.0
24.....	1.90	20.0	1.74	13.7	2.02	28.0	2.23	52.0
25.....	1.78	15.0	1.74	13.7	2.02	28.0	2.44	86.0
26.....	1.76	14.3	1.70	12.4	1.97	24.0	2.58	111.0
27.....	1.76	14.3	1.68	11.8	1.94	22.0	2.59	113.0
28.....	1.76	14.3	1.66	11.3	1.92	21.0	2.45	88.0
29.....	1.75	14.0	1.66	11.3	1.90	20.0	2.29	61.0
30.....	1.74	13.7	1.67	11.6	1.90	20.0	2.24	54.0
31.....	1.74	13.7			1.88	19.1		

DAILY GAUGE HEIGHT AND DISCHARGE of Boundary Creek at Fidler Brothers' Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.54	104	2.32	66.0	1.83	16.9	1.90	20.0
2.....	2.52	101	2.30	63.0	1.84	17.3	1.92	21.0
3.....	2.49	95	2.26	57.0	1.86	18.2	2.00	22.0
4.....	2.29	61	2.19	47.0	2.25	55.0	2.03	28.0
5.....	2.24	54	2.14	40.0	2.10	35.0	2.03	28.0
6.....	2.21	49	2.10	35.0	2.00	26.0	2.05	30.0
7.....	2.19	47	2.07	32.0	1.96	24.0	2.04	29.0
8.....	2.14	40	2.04	29.0	1.91	21.0	2.03	28.0
9.....	2.14	40	2.03	28.0	1.95	23.0	2.00	26.0
10.....	2.14	40	2.02	28.0	2.11	30.0	2.00	26.0
11.....	2.09	34	2.00	26.0	2.09	34.0	2.00	26.0
12.....	2.05	30	1.98	25.0	2.06	31.0	2.02	28.0
13.....	2.04	29	1.98	25.0	2.04	29.0	2.02	28.0
14.....	2.04	29	2.00	26.0	2.03	28.0	1.99	25.0
15.....	2.02	28	1.98	25.0	2.00	26.0	2.02	28.0
16.....	2.02	28	1.96	24.0	1.98	25.0	2.04	29.0
17.....	2.08	33	1.96	24.0	1.96	24.0	2.02	28.0
18.....	2.64	122	1.94	22.0	1.95	23.0	2.00	26.0
19.....	2.55	106	1.96	24.0	1.96	24.0	2.00	26.0
20.....	2.17	44	2.04	29.0	1.96	24.0	1.98	25.0
21.....	2.14	40	2.01	27.0	1.94	22.0	1.96	24.0
22.....	2.11	36	2.00	26.0	1.92	21.0	1.95	23.0
23.....	2.05	30	1.96	24.0	1.92	21.0	1.94	22.0
24.....	2.04	29	1.94	22.0	1.94	22.0	1.93	22.0
25.....	2.05	30	1.92	21.0	1.94	22.0	1.92	21.0
26.....	2.34	69	1.90	20.0	1.94	22.0	1.92	21.0
27.....	2.34	69	1.88	19.1	1.94	22.0	1.93	22.0
28.....	2.34	69	1.86	18.2	1.94	22.0	1.92	21.0
29.....	2.36	73	1.86	18.2	1.94	22.0	1.90	20.0
30.....	2.34	69	1.84	17.3	1.92	21.0	1.89	19.5
31.....	2.32	66	1.84	17.3			1.88	19.1

# MONTHLY DISCHARGE of Boundary Creek at Fidler Brothers' Ranch, for 1915.

(Drainage area 44 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (18-31).....	20.0	13.7	17.0	0.386	0.201	472
April.....	18.2	11.3	15.7	0.357	0.398	934
May.....	41.0	17.3	27.8	0.632	0.729	1,709
June.....	277.0	18.2	88.2	0.200	0.223	5,248
July.....	122.0	28.0	54.6	1.241	1.431	3,357
August.....	66.0	17.3	29.2	0.664	0.766	1,795
September.....	55.0	16.9	25.2	0.573	0.639	1,500
October.....	30.0	19.1	24.7	0.562	0.648	1,519
The period.....					5.035	16,534

## SESSIONAL PAPER No. 25c

## ST. MARY RIVER NEAR KIMBALL.

*Location.*—Cable station on SW.  $\frac{1}{4}$  Sec. 25, Tp. 1, Rge. 25, W. 4th Mer., about 2,000 feet above the Alberta Railway & Irrigation Company's dam.

*Records available.*—April 13, 1908, to December 31, 1915.

*Gauges.*—Friez automatic stage recorder, housed in a concrete shelter, about 3,000 feet above the cable station. Zero of automatic gauge maintained at 88.75 feet during 1913-15. Vertical staff at summer cable station. Zero of staff maintained at 85.84 feet during 1914-15. Chain gauge at winter station located at the bridge on the SW.  $\frac{1}{4}$  Sec. 1, Tp. 2, Rge. 25, W. 4th Mer. Zero of gauge maintained at 86.97 feet during 1914-15.

*Bench-marks.*—At automatic gauge; a spike on the downstream side of the concrete shelter. Assumed elevation, 100.00 feet. At summer station, a permanent iron bench-mark. Assumed elevation, 100.00 feet. At winter station, a permanent iron bench-mark. Assumed elevation, 100.00 feet; located 131 feet northeast of the right abutment of the bridge.

*Channel.*—Consists of sand and gravel liable to slight shifting conditions.

*Discharge measurements.*—Made from cable car; and by wading in conjunction with measurements from cable car, when water is low enough.

*Winter flow.*—Difficulty is often experienced in obtaining accurate discharge during the winter months owing to slush ice and the formation of more than one layer of ice. Measurements of this season are obtained at the SW.  $\frac{1}{4}$  Sec. 1, Tp. 2, Rge. 25, W. 4th Mer.

*Diversions.*—Alberta Railway & Irrigation Company's canal, capacity about 700 sec.-ft.; below the station about one-half mile.

*Observer.*—J. M. Dunn, Kimball, Alberta.

*Remarks.*—This station is maintained in co-operation with the stream measurement work carried out by the United States Geological Surveys.

## DISCHARGE MEASUREMENTS of St. Mary River near Kimball, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 1	O. H. Hoover	90	196	0.92	5.04 <sub>a</sub>	181
Jan. 19	J. E. Degnan	80	143	1.05	5.46	150
Jan. 21	do	77	132	1.22	5.15	161
Feb. 8	do	99	50	2.39	5.29	120
Feb. 8	do	77	149	0.96	5.29	143
Feb. 10	do	100	49	2.31	5.19	112
Feb. 26	do	53	80	1.44	4.78	116
Feb. 27	do	53	78	1.51	4.88	117
Mar. 6	do	53	77	1.30	4.70	109
Mar. 15	do	53	88	1.54	5.03	136
Mar. 18	do	86	131	1.92	5.28	253
Mar. 25	do	83	100	1.41	4.53 <sub>a</sub>	141
Mar. 29	do	68	160	1.10	1.61 <sub>b</sub>	176
April 2	do	89	177	1.31	1.88	244
April 3	do	164	200	1.27	1.95	255
April 19	V. A. Newhall	198	331	2.38	2.86	788
April 21	do	224	364	2.52	3.02	918
April 23	do	224	373	2.56	3.04	954
April 24	W. A. Lamb (U.S.G.S.)	223	361	2.47	3.06	890
May 5	V. A. Newhall	227	497	3.29	3.76	1,634
May 10	do	229	564	3.63	4.12	2,051
May 22	do	226	449	2.06	3.50	1,326
May 27	W. A. Lamb (U.S.G.S.)	229	449	3.10	3.54	1,390
June 10	V. A. Newhall	230	592	4.06	4.42	2,406
June 11	do	228	541	3.73	4.21	2,020
June 16	do	230	571	3.91	4.26	2,233
July 12	do	228	478	3.46	3.75	1,659
July 13	do	227	456	3.31	3.67	1,512
July 15	B. E. Jones (U.S.G.S.)	227	434	3.18	3.56	1,380
July 16	V. A. Newhall	226	430	3.14	3.50	1,350
Aug. 3	do	224	416	3.01	3.38	1,253
Aug. 6	do	224	393	2.93	3.26	1,150
Aug. 9	W. A. Lamb and J. C. Hoyt (U.S.G.S.)	225	357	2.81	3.20	1,004
Aug. 17	V. A. Newhall	202	348	2.68	3.05	934
Oct. 7	do	196	336	2.71	2.85	909
Nov. 10	W. H. Storey	179	286	2.01	3.51 <sub>f</sub>	576
Nov. 12	do	170	255	2.08	3.24 <sub>f</sub>	530
Dec. 5	do	104	108	3.10	3.37 <sub>g</sub>	356
Dec. 8	do	104	105	3.02	3.32	317
Dec. 22	do	59	70	2.63	2.93	185
Dec. 24	do	57	65	2.16	2.84	141
Dec. 27	do	57	64	2.29	2.85 <sub>g</sub>	147

*a* to *a* Winter gauge at bridge.

*b* to *b* Summer gauge at automatic gauge.

*f* to *f* Staff gauge at cable.

*g* to *g* Winter gauge at bridge.

## DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary River near Kimball, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	5.06 <sup>a</sup>	181	5.50	148	4.65	114	1.79	212	3.57	1,420	3.61	1,461
2.....	5.16 <sup>d</sup>	180	5.42 <sup>d</sup>	146	4.50	112	1.87	240	3.77	1,637	3.63	1,483
3.....	5.25	182	5.35	143	4.70	108	1.94	266	3.85	1,730	4.32	2,306
4.....	5.25	184	5.50	140	4.80	108	1.99	286	3.81	1,682	4.39	2,397
5.....	4.70	185	5.40	137	4.75	109	2.04	306	3.76	1,626	4.45 <sup>d</sup>	2,475
6.....	4.35	186	5.40	133	4.68	110	2.69	326	3.66	1,515	4.45 <sup>d</sup>	2,475
7.....	4.15	186	5.30	130	4.71 <sup>d</sup>	111	2.11	334	3.58	1,430	4.35	2,345
8.....	4.70	185	5.29	126	4.74	113	2.14	348	3.69	1,549	4.36	2,358
9.....	4.65	183	5.25	121	4.62 <sup>d</sup>	117	2.08	322	3.98	1,886	4.30	2,280
10.....	4.48 <sup>d</sup>	180	5.20	115	4.50	121	2.11	334	4.12	2,054	4.46	2,488
11.....	4.30	177	5.20	110	4.60	125	2.07 <sup>d</sup>	318	4.18	2,126	4.24	2,202
12.....	4.25	173	5.25	110	4.65	129	2.08	322	4.12	2,054	4.14 <sup>d</sup>	2,078
13.....	4.15	169	5.20	110	4.74	131	2.12	339	4.16	2,102	4.08	2,006
14.....	4.70	165	5.20	111	4.92 <sup>d</sup>	133	2.23	388	4.25	2,215	4.15	2,090
15.....	5.55	160	5.15	111	5.10	137	2.35	448	4.20	2,150	4.21	2,163
16.....	5.20	157	5.15	111	5.15	150	2.44	497	4.06 <sup>d</sup>	1,982	4.28	2,254
17.....	5.35 <sup>d</sup>	153	5.30	111	5.22 <sup>d</sup>	175	2.52	543	3.93	1,826	4.26	2,228
18.....	5.50	151	5.15	111	5.30	218	2.68	647	3.90	1,790	4.45	2,475
19.....	5.50	150	5.15	107	5.33	253	2.84	765	3.78	1,648	4.39 <sup>d</sup>	2,297
20.....	5.43	155	5.00	102	4.86	262	3.00	890	3.65	1,505	4.30	2,280
21.....	5.15	164	4.15	96 <sup>*</sup>	4.95	265	3.02	907	3.55	1,400	4.21	2,163
22.....	5.25	166	4.65	93	4.70	260	3.06	941	3.49	1,340	4.16	2,102
23.....	5.35	166	4.90	95	4.65	220	3.05	932	3.42	1,270	4.10	2,030
24.....	5.32 <sup>d</sup>	166	4.78	104	4.50	180	3.03	916	3.43	1,280	4.11	2,042
25.....	5.28 <sup>d</sup>	165	4.80	114	4.60	142	3.00	890	3.50	1,350	4.46	2,488
26.....	5.25	164	4.85	116	4.65	140	3.00	890	3.51	1,360	4.60 <sup>d</sup>	2,670
27.....	5.25	160	4.88	116	4.70	150	2.98	874	3.53	1,380	4.55 <sup>d</sup>	2,605
28.....	5.40	158	4.65	117	4.66 <sup>ad</sup>	160	2.97	866	3.52	1,370	4.46	2,488
29.....	5.38 <sup>d</sup>	154	.....	.....	1.62 <sup>b</sup>	165	3.00	890	3.54	1,390	4.38	2,384
30.....	5.35	151	.....	.....	1.61	162	3.15	1,018	3.60	1,450	4.32	2,306
31.....	5.42 <sup>d</sup>	149	.....	.....	1.72	191	.....	.....	3.60	1,450	.....	.....

*a* to *a* Ice conditions and chain gauge records at bridge.

*b* to *b* Open water conditions and records from automatic gauge.

*c* to *c* Ice conditions and chain gauge records at bridge.

*d* Estimated gauge heights.



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary River near Kimball, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>	<i>Fed.</i>	<i>Sec.-ft.</i>
1.....	4.48	2,514	3.51	1,360	2.69	654	2.39	470	2.38	464	3.63	347
2.....	4.42	2,436	3.45	1,300	2.86	780	2.45	502	2.35	448	3.36	341
3.....	4.48	2,514	3.39	1,240	3.82	1,694	2.60	595	2.35	448	3.43	339
4.....	4.36	2,358	3.34	1,193	3.64 <sup>d</sup>	1,494	2.70	660	2.35	448	3.46	338
5.....	4.23	2,189	3.30	1,155	3.40	1,250	2.82	750	2.38	464	3.37	336
6.....	4.14	2,078	3.26	1,117	3.20	1,060	2.90	810	2.33 <sup>d</sup>	436	3.33	332
7.....	4.13	2,066	3.21	1,070	3.09	966	2.82	780	2.30 <sup>d</sup>	420	3.35	327
8.....	4.10	2,030	3.20	1,060	2.98	874	2.85	772	2.28	411	3.32	316
9.....	4.06	1,982	3.20	1,060	2.99	882	2.78	720	2.25	398	3.30	310
10.....	4.02	1,934	3.18	1,043	3.04	924	2.73	682	2.24	393	3.15	302
11.....	3.84	1,718	3.15	1,018	2.96 <sup>d</sup>	858	2.71	668	2.20	375	3.20	295
12.....	3.75	1,615	3.13	1,000	2.89 <sup>d</sup>	802	2.70	660	2.20	375	3.30	287
13.....	3.66	1,516	3.14	1,009	2.86	780	2.61	602	2.18	366	3.15	278
14.....	3.64	1,494	3.18	1,043	2.83	758	2.58	582	2.28 <sup>db</sup>	411	3.28	269
15.....	3.58	1,430	3.08 <sup>d</sup>	958	2.77	712	2.60	595	3.56 <sup>c</sup>	411	3.22	259
16.....	3.50	1,350	3.07	950	2.69	654	2.60	595	3.63	406	3.15	250
17.....	3.68	1,538	3.05	932	2.70	660	2.58	582	3.73	404	3.12	239
18.....	4.12 <sup>d</sup>	2,054	3.02	907	2.83	758	2.54	556	3.73	402	3.15	229
19.....	4.00 <sup>d</sup>	1,910	3.01	898	3.00	890	2.52	543	3.88	400	3.05 <sup>d</sup>	213
20.....	3.63	1,483	3.15	1,018	2.99	882	2.48	519	3.23	399	2.95	205
21.....	3.46	1,310	3.12	992	2.92	826	2.45	502	3.53	398	3.00	194
22.....	3.42	1,270	3.02 <sup>d</sup>	907	2.81	742	2.44	497	3.63	397	2.93	185
23.....	3.40	1,250	2.97	866	2.82	750	2.43	492	3.53	396	2.95	151
24.....	3.39	1,240	2.91	818	2.80	735	2.41	480	3.50	396	2.84	142
25.....	3.39	1,240	2.88	795	2.78	720	2.34	442	3.43 <sup>d</sup>	395	2.83 <sup>d</sup>	140
26.....	3.51	1,360	2.83	758	2.71	668	2.34	442	3.36	394	2.86	142
27.....	3.53	1,380	2.81	742	2.69	654	2.38	464	3.44	390	2.85	147
28.....	3.76	1,626	2.81	742	2.66	634	2.41	480	3.54 <sup>d</sup>	383	2.80 <sup>d</sup>	150
29.....	3.69	1,549	2.79	728	2.65	628	2.45	502	3.63	372	2.75	155
30.....	3.69	1,549	2.74	690	2.58	582	2.46	508	3.48	354	3.25	154
31.....	3.56	1,410	2.73	682	.....	.....	2.45	502	.....	.....	4.10 <sup>c</sup>	153

a to a Ice conditions, and chain gauge records at bridge.

b to b Open water conditions with records from automatic gauge.

c to c Ice conditions, and chain gauge records at bridge.

d Estimated gauge heights.

## MONTHLY DISCHARGE of St. Mary River near Kimball, for 1915.

(Drainage area 472 square miles)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total In Acre-feet.
January.....	186	149	168	0.35 <sup>c</sup>	0.41	10,330
February.....	148	93	117	0.248	0.26	6,498
March.....	265	108	157	0.333	0.38	9,654
April.....	1,018	212	575	1.220	1.36	34,215
May.....	2,215	1,270	1,645	3.490	4.02	101,145
June.....	2,670	1,461	2,231	4.770	5.32	133,940
July.....	2,514	1,240	1,722	3.648	4.21	105,882
August.....	1,300	1,300	909	2.033	2.37	59,581
September.....	1,694	1,694	842	1.784	1.99	50,102
October.....	810	810	579	1.237	1.42	35,601
November.....	464	464	405	0.853	0.96	24,099
December.....	347	347	243	0.515	0.50	14,941
The year.....	.....	.....	.....	.....	23.29	585,988

## ALBERTA RAILWAY AND IRRIGATION COMPANY'S CANAL AT KIMBALL.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 36, Tp. 1, Rge. 25, W. 4th Mer., at a concrete measuring section 500 feet below the control gates at the intake of the Alberta Railway and Irrigation Company's canal.

*Records available.*—From April 27, 1915, to October 9, 1915.

*Gauge.*—Inclined staff, set in concrete slopes of  $1\frac{1}{2}$  to 1. Graduations on staff developed for slopes of  $1\frac{1}{2}$  to 1.

*Channel.*—Above and below section, stream bed is composed of loose gravel and boulders. At section bed is composed of mixed gravel, levelled and tamped. Stream bed not liable to shift as velocities are not excessive.

*Discharge measurements.*—Made from foot bridge having a trussed-span of 44 feet, with one hand-rail.

*Artificial control.*—The discharge is controlled by headgates 500 feet above the measuring section.

*Observer.*—W. D. Willgrass.

*Remarks.*—This station serves to register the amount of water diverted from the St. Mary River at Kimball for the Alberta Railway and Irrigation Company's purposes. In wet seasons there is more water registered at the Alberta Railway and Irrigation Company's flume, six miles below the headgates, owing to ground water flowing into the canal, but in dry seasons the diversion from the St. Mary River is the sole source of supply.

## DISCHARGE MEASUREMENTS of the Alberta Railway and Irrigation Company's Canal at Kimball, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 6.....	V. A. Newhall.....	34.0	97.92	2.77	3.410	272
May 11.....	do .....	34.0	98.40	2.81	3.440	276
May 21.....	do .....	34.9	112.00	3.03	3.800	339
May 22.....	do .....	35.5	119.30	3.12	4.005	372
June 12.....	do .....	34.8	109.70	3.03	3.745	333
July 12.....	do .....	32.7	86.30	2.63	3.005	227
Aug. 3.....	do .....	32.1	80.91	2.57	2.800	208
Aug. 6.....	do .....	32.2	79.16	2.45	2.800	194
Aug. 17.....	do .....	32.2	78.68	2.50	2.800	196

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's Canal  
at Kimball, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.	Gauge Height.	Dis- charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1. ....			3.02	224	3.99	368
2. ....			2.99	221	4.00	370
3. ....			3.19	247	3.94	360
4. ....			3.20	248	3.91	356
5. ....			3.38	273	3.59	332
6. ....			3.39	275	3.90	354
7. ....			3.40	276	3.90	354
8. ....			3.40	276	3.91	356
9. ....			3.40	276	3.92	357
10. ....			3.39	275	3.82	341
11. ....			3.45	283	3.76	332
12. ....			3.39	275	3.74	328
13. ....			3.79	336	3.72	325
14. ....			3.79	336	3.76	332
15. ....			3.80	338	3.76	332
16. ....			3.78	335	3.76	332
17. ....			3.79	336	3.74	328
18. ....			3.79	336	3.74	328
19. ....			3.76	332	3.70	322
20. ....			3.78	335	3.65	314
21. ....			3.79	336	3.64	312
22. ....			3.98	367	3.64	312
23. ....			3.99	368	3.65	314
24. ....			4.00	370	3.55	298
25. ....			3.98	367	1.90	113
26. ....			3.98	367	3.00	222
27. ....			1.00	58	4.00	370
28. ....			2.60	177	3.98	367
29. ....			2.50	167	3.67	299
30. ....			2.50	167	4.00	370
31. ....			3.98	367	2.98	220
			4.00	370		

Gates opened on April 27.

Gates closed on October 9

DAILY GAUGE HEIGHT AND DISCHARGE of the Alberta Railway and Irrigation Company's Canal at Kimball, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.01	223	2.89	209	2.79	198	3.22	251
2.....	2.99	221	2.78	197	2.80	199	3.26	256
3.....	3.20	248	2.80	199	2.82	201	3.25	255
4.....	3.19	247	2.80	199	2.80	199	3.26	256
5.....	3.10	234	2.79	198	2.79	198	3.02	224
6.....	3.00	222	2.80	199	2.80	199	2.80	199
7.....	3.00	222	2.80	199	2.80	199	2.80	199
8.....	2.99	221	2.80	199	3.18	245	2.80	199
9.....	3.00	222	2.80	199	3.40	276		
10.....	2.99	221	2.80	199	3.39	275		
11.....	3.00	222	2.80	199	3.38	273		
12.....	2.99	221	2.79	198	3.38	273		
13.....	3.00	222	2.80	199	3.38	273		
14.....	3.00	222	2.80	199	3.25	255		
15.....	2.99	221	2.80	199	3.25	255		
16.....	2.99	221	2.80	199	3.25	255		
17.....	3.02	224	2.80	199	3.24	254		
18.....	2.99	221	2.79	198	3.24	254		
19.....	3.00	222	2.81	200	3.25	255		
20.....	2.98	220	2.80	199	3.25	255		
21.....	2.99	221	2.79	198	3.24	254		
22.....	3.00	222	2.80	199	3.22	251		
23.....	3.00	222	2.80	199	3.24	254		
24.....	3.00	222	2.80	199	3.26	256		
25.....	3.00	222	2.80	199	3.24	254		
26.....	3.00	222	2.80	199	3.22	251		
27.....	3.00	222	2.80	199	3.24	254		
28.....	2.98	220	2.80	199	3.24	254		
29.....	2.90	210	2.80	199	3.25	255		
30.....	2.80	199	2.80	199	3.24	254		
31.....	2.90	210	2.80	199				

Gates opened on April 27.  
Gates closed on October 9.

MONTHLY DISCHARGE of Alberta Railway and Irrigation Company's Canal at Kimball, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (27-30).....	177	58	142	1,126
May.....	370	221	318	19,553
June.....	370	118	310	18,446
July.....	248	199	222	13,650
August.....	209	197	199	12,236
September.....	276	198	244	14,519
October (1-9).....	256	199	230	3,649
The period.....				83,179

Gates opened and water admitted April 27.  
Gates closed and water shut out October 9.

ALBERTA RAILWAY AND IRRIGATION COMPANY'S CANAL NEAR KIMBALL.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 24, W. 4th Mer., at the flume over Rolph Creek.  
*Records available.*—July 26, 1910, to October 8, 1915.  
*Gauge.*—Vertical staff. Zero level with bottom of flume at gauge.  
*Channel.*—Smooth plank flume 768 feet long.

## SESSIONAL PAPER No. 25c

*Discharge measurements.*—Made from a foot bridge, spanning the flume at a point about midway from the ends.

*Artificial control.*—The discharge is controlled by headgates at Kimball about six miles above the flume.

*Observer.*—J. M. Dunn, Kimball, for Alberta Railway and Irrigation Company.

*Remarks.*—A new flume was built just to the right, to replace the old structure, during October, November and December, 1914, and used during 1915. It is 27 feet wide and 8 feet deep. A vertical metal staff is countersunk in the left side of this flume about midway from the ends.

## DISCHARGE MEASUREMENTS of Alberta Railway and Irrigation Company's Canal near Kimball, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 6.....	V. A. Newhall.....	27.0	75.6	3.63	2.820	274
May 11.....	do.....	27.0	77.0	3.64	2.830	280
June 12.....	do.....	27.0	85.0	3.95	3.135	336
June 18.....	do.....	27.0	83.7	3.93	3.110	329
July 13.....	do.....	27.0	68.8	3.21	2.540	221
July 15.....	do.....	27.0	68.8	3.21	2.540	223
Aug. 4.....	do.....	27.0	66.3	2.99	2.400	198
Aug. 19.....	G. H. Whyte and V. A. Newhall.	27.0	66.2	2.96	2.405	196
Sept. 1.....	V. A. Newhall.....	27.0	65.4	2.98	2.405	194
Oct. 2.....	do.....	27.0	74.2	3.41	2.740	253

## DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's Canal, near Kimball, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.55	222	3.31	372
2.....			2.55	222	3.31	372
3.....			2.68	246	3.30	370
4.....			2.82	274	3.25	360
5.....			2.83	276	3.20	350
6.....			2.82	274	3.20	350
7.....			2.82	274	3.20	350
8.....			2.82	274	3.20	350
9.....			2.81	272	3.20	350
10.....			2.82	274	3.20	350
11.....			2.83	276	3.12	334
12.....			3.16	342	3.13	334
13.....			3.15	340	3.12	334
14.....			3.15	340	3.13	336
15.....			3.15	340	3.13	336
16.....			3.13	336	3.13	336
17.....			3.14	338	3.12	334
18.....			3.15	340	3.14	338
19.....			3.15	340	3.08	326
20.....			3.15	340	3.04	318
21.....			3.15	340	3.05	320
22.....			3.32	374	3.04	318
23.....			3.31	372	3.04	318
24.....			3.31	372	3.04	318
25.....			3.31	372	2.86	282
26.....			3.31	372	1.35	48
27.....	2.20	160	3.30	370	2.55	222
28.....	2.15	152	3.31	372	2.52	217
29.....	2.15	152	3.31	372	2.53	218
30.....	2.15	152	3.31	372	2.45	204
31.....			3.31	372		

Gates opened April 27.

Gates closed October 9.

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's Canal,  
near Kimball, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.57	226	2.40	195	2.40	195	2.70	250
2.....	2.55	222	2.38	191	2.40	195	2.73	256
3.....	2.70	250	2.38	191	2.40	195	2.72 <i>d</i>	254
4.....	2.68	246	2.40	195	2.39	193	2.72	254
5.....	2.68	246	2.40	195	2.40 <i>d</i>	195	2.71	252
6.....	2.54	220	2.40	195	2.40	195	2.40	195
7.....	2.54	220	2.40	195	2.60	231	2.40	195
8.....	2.54	220	2.40	195	2.83	276	2.40	195
9.....	2.54	220	2.40	195	2.83	276		
10.....	2.54	220	2.40	195	2.83	276		
11.....	2.54	220	2.40	195	2.82	274		
12.....	2.54	220	2.40	195	2.82	271		
13.....	2.54	220	2.40	195	2.82	274		
14.....	2.54	220	2.40	195	2.72	254		
15.....	2.54	220	2.40	195	2.70	250		
16.....	2.54	220	2.40	195	2.70	250		
17.....	2.54	220	2.40	195	2.70	250		
18.....	2.54	220	2.40	195	2.70	250		
19.....	2.54	220	2.40	195	2.70 <i>d</i>	250		
20.....	2.54	220	2.40	195	2.70	250		
21.....	2.55	222	2.40	195	2.70	250		
22.....	2.54	220	2.40	195	2.70	250		
23.....	2.54	220	2.40	195	2.70	250		
24.....	2.54	220	2.40	195	2.70	520		
25.....	2.55	222	2.40	195	2.70	250		
26.....	2.54	220	2.40	195	2.70	250		
27.....	2.54	220	2.40	195	2.70	250		
28.....	2.52	217	2.40	195	2.70	250		
29.....	2.54	220	2.40	195	2.70	250		
30.....	2.45	204	2.40	195	2.70	250		
31.....	2.42	199	2.40	195				

Gates opened April 27.  
Gates closed October 9.

MONTHLY DISCHARGE of Alberta Railway and Irrigation Company's Canal, near Kimball,  
for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (27-30).....	160	152	154	1,222
May.....	374	222	323	19,860
June.....	372	48	312	18,565
July.....	250	199	222	13,650
August.....	195	191	195	11,990
September.....	276	193	243	14,460
October (1-9).....	256	195	231	3,665
The period.....				83,412

Gates opened and water admitted April 27.  
Gates closed and water shut out October 9.

## SESSIONAL PAPER No. 25c

## ROLPH CREEK NEAR KIMBALL.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 24, W. 4th Mer.

*Records available.*—May 17, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 93.41 feet during 1913–15.

*Bench-mark.*—Permanent iron bench-mark located on the left bank 100 feet downstream.

Assumed elevation, 100.00 feet.

*Channel.*—Consists of sand, gravel and stone; likely to shift.

*Discharge measurements.*—Made by wading.

*Observer.*—J. M. Dunn, Kimball P.O., Alta.

## DISCHARGE MEASUREMENTS of Rolph Creek, near Kimball, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 26.....	J. E. Degnan.....	19.2	17.80	1.53	1.29	27.00
April 20.....	V. A. Newhall.....	8.0	4.62	0.86	0.62	3.97
May 11.....	do.....	8.5	4.47	0.87	0.62	3.91
June 12.....	do.....	27.1	26.00	2.72	1.65	71.00
June 18.....	do.....	26.2	23.28	2.29	1.54	53.00
July 13.....	do.....	20.5	18.27	1.15	1.15	21.00
July 15.....	do.....	20.2	16.33	1.05	1.04	17.20
Aug. 4.....	do.....	21.8	20.14	1.75	1.33	35.00
Aug. 19.....	do.....	12.2	6.18	0.96	0.76	5.90
Sept. 1.....	do.....	13.0	7.53	1.49	0.94	11.20
Oct. 2.....	do.....	14.0	9.55	1.62	1.02	15.40

## DAILY GAUGE HEIGHT AND DISCHARGE of Rolph Creek near Kimball, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.11	19.0	0.65	4.4	0.48	2.2
2.....			1.18	22.0	0.66 <sup>d</sup>	4.6	0.47	2.1
3.....			1.20	24.0	0.67	4.7	0.55	3.0
4.....			1.15	21.0	0.70	5.2	2.10	125.0
5.....			1.10	18.5	0.77	6.7	2.10	125.0
6.....			1.10	18.5	0.76	6.5	2.05	118.0
7.....			1.05	16.0	0.75	6.3	2.00	112.0
8.....			1.05	16.0	0.73	5.9	1.87	95.0
9.....			1.00	14.0	0.68	4.9	1.65	66.0
10.....			1.00	14.0	0.65	4.4	1.62	63.0
11.....			0.97	12.8	0.62	3.9	1.65	66.0
12.....			0.95	12.0	0.62	3.9	1.68	70.0
13.....			0.90	10.2	0.63	4.1	1.68	70.0
14.....			0.84	8.5	0.80	7.4	1.65	66.0
15.....			0.78	7.0	1.50	49.0	1.63	64.0
16.....			0.75	6.3	1.40	39.0	1.60	60.0
17.....			0.72	5.6	1.35	34.0	1.57	57.0
18.....			0.70 <sup>d</sup>	5.2	1.30	31.0	1.54	53.0
19.....			0.68	4.9	1.20	24.0	1.70	73.0
20.....			0.62	3.9	1.10	18.0	1.65 <sup>d</sup>	66.0
21.....			0.60	3.6	1.05	16.0	1.60	60.0
22.....	1.75	80.0	0.60	3.6	1.00	14.0	1.50	49.0
23.....	1.70	73.0	0.58	3.4	0.98	13.2	1.40	39.0
24.....	1.50	49.0	0.56	3.1	0.95	12.0	1.35	34.0
25.....	1.40	39.0	0.56 <sup>d</sup>	3.1	0.93	11.3	1.40	39.0
26.....	1.29	29.0	0.55	3.0	0.88	9.4	2.75	210.0
27.....	1.25	27.0	0.60	3.6	0.80	7.4	2.60	190.0
28.....	1.25 <sup>d</sup>	27.0	0.58	3.1	0.70	5.2	2.30	177.0
29.....	1.25	27.0	0.50	2.4	0.60	3.6	2.38	161.0
30.....	1.15	21.0	0.50	2.4	0.48	2.2	2.35	144.0
31.....	1.12	19.5			0.47	2.1		

<sup>d</sup> Estimated gauge height.



DAILY GAUGE HEIGHT AND DISCHARGE of Rolph Creek near Kimball, for 1915.—*Concluded.*

MONTH.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.10	125.0	1.54 <i>d</i>	53.0	0.94	11.6	1.00	14.0
2.....	1.90	99.0	1.50	49.0	1.13 <i>d</i>	20.0	1.02	14.8
3.....	1.70	73.0	1.45	44.0	1.31 <i>d</i>	32.0	1.04 <i>d</i>	15.6
4.....	1.58	58.0	1.33	33.0	1.50	49.0	1.05	16.0
5.....	1.50	49.0	1.28	29.0	1.50	49.0	1.05	16.0
6.....	1.45	44.0	1.25	27.0	1.55	54.0	1.08	17.2
7.....	1.45	44.0	1.20	24.0	1.50	49.0	1.20	24.0
8.....	1.45	44.0	1.15 <i>d</i>	21.0	1.38	37.0	1.23	26.0
9.....	1.45	44.0	1.10	18.5	1.28	29.0	1.20	24.0
10.....	1.45	44.0	1.00	14.0	1.20	24.0	1.19 <i>d</i>	23.0
11.....	1.38	37.0	0.95	12.0	1.15	21.0	1.18	22.0
12.....	1.27	28.0	0.90	10.2	1.15 <i>d</i>	21.0	1.17 <i>d</i>	22.0
13.....	1.15	21.0	0.87	9.5	1.15	21.0	1.16	22.0
14.....	1.15	21.0	0.80	7.4	1.15	21.0	1.16 <i>d</i>	22.0
15.....	1.04	15.6	0.78 <i>d</i>	7.0	1.12	19.5	1.15	21.0
16.....	1.17	22.0	0.77	6.7	1.10	18.5	1.08 <i>d</i>	17.2
17.....	1.17	22.0	0.77 <i>d</i>	6.7	1.10	18.5	1.00	14.0
18.....	1.25	27.0	0.76 <i>d</i>	6.5	1.10	18.5	1.00	14.0
19.....	1.35	34.0	0.76	6.5	1.08 <i>d</i>	17.2	0.98 <i>d</i>	13.2
20.....	1.35	34.0	1.68	70.0	1.07	16.8	0.97	12.8
21.....	1.35	34.0	1.71	74.0	1.05	16.0	0.97 <i>d</i>	12.8
22.....	1.34	34.0	1.68 <i>d</i>	70.0	1.05	16.0	0.97	12.8
23.....	1.33	33.0	1.65	66.0	1.00	14.0	0.97	12.8
24.....	1.27	28.0	1.60	60.0	1.15	21.0	0.95	12.0
25.....	1.20	24.0	1.55 <i>d</i>	54.0	1.10	18.5	0.95 <i>d</i>	12.0
26.....	1.15	21.0	1.50	49.0	1.08 <i>d</i>	17.2	0.95	12.0
27.....	1.10	18.5	1.45	44.0	1.05	16.0	0.95	12.0
28.....	1.10	18.5	1.38 <i>d</i>	37.0	1.05	16.0	0.95	12.0
29.....	1.40	39.0	1.30	31.0	1.05	16.0	0.95 <i>d</i>	12.0
30.....	1.45	44.0	1.15 <i>d</i>	21.0	1.05	16.0	0.95	12.0
31.....	1.58	58.0	1.00	14.0	.....	.....	0.95 <i>d</i>	12.0

*d* Estimated gauge height.

## MONTHLY DISCHARGE of Rolph Creek near Kimball, for 1915.

(Drainage area 74 square miles.)

DAY.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	80.	19.5	39.2	0.530	0.197	777
April.....	24.	2.4	9.7	0.131	0.146	577
May.....	49.	2.1	11.8	0.160	0.184	726
June.....	210.	2.1	82.0	1.108	1.236	4,879
July.....	125.	15.6	39.9	0.540	0.623	2,453
August.....	74.	6.5	31.4	0.424	0.489	1,931
September.....	54.	11.6	23.8	0.321	0.358	1,416
October.....	26.	12.0	16.3	0.220	0.254	1,002
The period.....	.....	.....	.....	.....	3.487	13,761

## LEE CREEK AT LAYTON'S RANCH.

*Location.*—SE.  $\frac{1}{4}$  Sec. 27, Tp. 2, Rge. 26, W. 4th Mer., at B. Layton's ranch.*Records available.*—May 25, 1913, to December 31, 1915.*Gauge.*—Vertical staff. Zero of gauge maintained at elevation 88.14 feet during 1913-14 and to June 6, 1915. New gauge rod set in stream on June 6, 1915. Elevation of zero of rod 90.79 referred to permanent iron bench-mark.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet, located on the left bank about 10 feet above the gauge.*Channel.*—Straight and quite uniform with a flat rock and boulder bed, not liable to shift.

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*Discharge measurements.*—Made by wading at all ordinary stages, and from a temporary cable at very high stages.

*Winter flow.*—Obtained through the ice 800 feet above the gauge.

*Observer.*—B. Layton, Cardston, Alta.

## DISCHARGE MEASUREMENTS of Lee Creek at Layton's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 4.	O. H. Hoover.	19.5	14.4	1.63	2.540	23.0
Jan. 15.	do	19.4	12.6	1.39	2.460	17.4
Feb. 1.	W. A. Burton.	17.5	9.4	1.45	2.700	13.6
Feb. 16.	J. E. Degnan.	17.0	9.6	1.39	3.005	13.3
Mar. 8.	do	16.5	7.5	1.26	2.145	9.6
Mar. 22.	do	51.5	41.7	1.36	2.150	57.0
April 7.	V. A. Newhall.	48.5	40.6	1.55	2.070	63.0
April 19.	do	67.0	91.0	2.70	2.640	246.0
June 26.	do	71.0	113.7	3.10	2.705 <sup>f</sup>	353.0
July 6.	do	66.0	87.6	2.37	2.205	208.0
July 28.	do	68.4	97.2	2.85	2.390	277.0
Aug. 21.	do	59.4	76.0	2.50	2.160	190.0
Sept. 3.	W. A. Burton.	66.5	98.2	2.90	2.500	284.0
Oct. 19.	V. A. Newhall.	53.5	65.8	2.08	1.950	137.0
Nov. 15.	W. H. Storey.	47.5	51.0	1.37	1.750	70.0
Nov. 19.	do	49.0	52.9	1.24	1.710	67.0
Nov. 29.	do	49.0	46.8	1.20	1.660	56.0
Dec. 10.	do	40.0	25.7	1.11	1.360	29.0
Dec. 29.	do	34.0	19.1	1.11	1.980	21.0

<sup>f</sup> New gauge station.

## DAILY GAUGE HEIGHT AND DISCHARGE of Lee Creek at Layton's Ranch, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	2.35 <sup>d</sup>	21.0 <sup>a</sup>	2.69	13.6	2.59	11.6	1.97	45	2.48	179	2.25	103
2.	2.54	22.0	2.70	14.0	2.57	10.6	2.01	52	2.81	346	2.48	179
3.	2.55	23.0	2.74	14.2	2.53	9.9	2.03	55	2.80	340	2.98	444
4.	2.50	23.0	2.76	14.5	2.56	9.4	2.04	57	2.77	323	2.95 <sup>d</sup>	427
5.	2.50	23.0	2.71	14.8	2.66	9.3	2.07	63	2.64	253	2.92 <sup>d</sup>	410
6.	2.54	23.0	2.67	14.8	2.73	9.3	2.08	64	2.30	117	2.89 <sup>d</sup>	392
7.	2.56	22.0	2.62	14.8	2.77	9.4	2.07	63	2.27	109	2.86 <sup>f</sup>	413
8.	2.59	21.0	2.52	14.4	2.85	9.6	2.05	59	2.25	103	2.64	343
9.	2.58	20.0	2.57	14.1	2.90	9.8	1.98	47	2.23	98	2.57	320
10.	2.57	19.4	2.62	13.8	2.92	10.0	2.01	52	2.21	93	3.25	543
11.	2.46	18.6	2.54	13.0	2.92 <sup>d</sup>	10.3	2.02	54	2.21	93	3.00	458
12.	2.41	18.1	2.59	12.8	2.91	10.6	2.04	57	2.20	90	2.95	442
13.	2.39	17.8	2.66 <sup>d</sup>	12.6	2.91	11.0	2.04	57	2.38	142	2.87	416
14.	2.42	17.6	2.74	12.8	2.87	11.3	2.14	76	2.47	174	3.12	499
15.	2.45	17.4	2.84	13.0	2.87	11.8	2.15	78	2.75	311	3.30	560
16.	2.48	17.3	2.85	13.4	2.87	12.3	2.12	72	2.71	289	2.91	429
17.	2.57	17.0	2.82	13.8	2.82	13.0	2.13	74	2.64	253	2.90	426
18.	2.56 <sup>d</sup>	16.8	2.80	14.1	2.72	14.1	2.12	72	2.57	219	3.05	475
19.	2.55	16.2	2.80	14.2	2.52 <sup>d</sup>	16.2	2.10	68	2.64	253	3.02	465
20.	2.57	15.5	2.50	14.0	2.32	19.9	2.07	63	2.45	166	2.70	362
21.	2.58	14.7	2.49	12.5	2.21	26.0 <sup>a</sup>	2.06	61	2.42	155	2.45	282
22.	2.60	14.1	2.39	11.8	2.15	78.0	2.05	59	2.40	148	2.30	234
23.	2.02	13.8	2.31	11.9	2.20	90.0	2.03	55	2.78	142	2.25	219
24.	2.04 <sup>d</sup>	13.3	2.28	13.0	2.20	90.0	2.03	55	2.38	142	2.20	204
25.	2.66	13.2	2.38	14.1	2.14	76.0	2.02	54	2.36	135	2.38	260
26.	2.64	13.0	2.93	14.5	1.84	29.0	2.02	54	2.34	129	2.71	365
27.	2.04	13.0	2.62	14.3	1.86	31.0	2.01	52	2.34	129	2.65	346
28.	2.02	13.1	2.60 <sup>d</sup>	13.5	1.88	34.0	2.00	50	2.33	126	2.47	288
29.	2.02	13.1	...	...	1.93	40.0	2.20	90	2.32	123	2.27	325
30.	2.02	13.2	...	...	1.93	40.0	2.30	117	2.32	123	2.33	240
31.	2.66 <sup>d</sup>	13.2	...	...	1.95	42.0	...	...	2.30	117	...	...

<sup>a</sup> to <sup>a</sup> Ice conditions.

<sup>b</sup> to <sup>b</sup> Open water conditions.

<sup>d</sup> Estimated gauge height.

<sup>f</sup> New gauge station after June 6.

DAILY GAUGE HEIGHT AND DISCHARGE of Lee Creek at Layton's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.30	234	2.22	210	1.31	26	1.68	60	1.62	49	1.69	62
2.....	2.30	234	2.20	204	1.57	41	1.72	69	1.60	45	1.67	58
3.....	2.26	222	2.16	192	2.62	336	1.78	83	1.60	45	1.66	56
4.....	2.23	213	2.10	174	1.95	129	1.86	104	1.59	44	1.66	56
5.....	2.20	204	2.03	153	1.70	64	1.85	101	1.59	44	1.66	56
6.....	2.23	213	1.93	123	1.64	52	1.87	107	1.58	42	1.68	60
7.....	2.18	198	1.90	115	1.60	45	1.86	104	1.58	42	1.68	60
8.....	2.10	174	1.85	101	1.54	37	1.86	104	1.58	42	1.69	62
9.....	2.00	144	1.80	88	1.75	76	1.82	93	1.60	45	1.53 <sup>d</sup>	36
10.....	1.95	129	1.76	78	1.85	101	1.88	93	1.60	45	1.36	27
11.....	1.90	115	1.71	66	1.78	83	1.86	104	1.60	45	1.38	28
12.....	1.85	101	1.68	70	1.72	69	1.82	93	1.60	45	1.38	28
13.....	1.90	115	1.75	76	1.75	76	1.88	109	1.63	50	1.39	29
14.....	1.85	101	1.69	62	1.70	64	1.88	109	1.65	54	1.43	30
15.....	1.80	88	1.69	62	1.68	60	1.89	112	1.75	76	1.45 <sup>g</sup>	31
16.....	1.76	78	1.65	54	1.68	60	1.90	115	1.69	62	1.41	29
17.....	1.73	71	1.63	50	1.67	58	1.90	115	1.70	64	1.37	28
18.....	2.12	180	1.57	41	1.64	52	1.92	121	1.72	69	1.35	27
19.....	2.09	171	1.55	38	1.78	83	1.93	123	1.71	66	1.34 <sup>d</sup>	27
20.....	1.96	132	2.60	330	1.75	76	1.94	126	1.72	69	1.33	27
21.....	1.80	88	2.00	144	1.70	64	1.90	115	1.72	69	1.32	26
22.....	1.76	78	1.75	76	1.68	60	1.84	98	1.72	69	1.33	27
23.....	1.68	60	1.70	64	1.66	56	1.78	83	1.73	71	1.32	26
24.....	1.66	56	1.65	54	1.64	52	1.75	76	1.73	71	1.34	27
25.....	1.74	74	1.54	37	1.68	60	1.73	71	1.74	74	1.34	27
26.....	1.78	83	1.52	36	1.67	58	1.70	64	1.69	62	1.33	27
27.....	2.15	189	1.45	31	1.66	56	1.68	60	1.67	58	1.32	26
28.....	2.38	260	1.42	30	1.63	50	1.66	56	1.66 <sup>d</sup>	56	1.32	26
29.....	2.30	234	1.40	29	1.61	47	1.65	54	1.66	56	1.37	28
30.....	2.27 <sup>d</sup>	225	1.38	28	1.60	45	1.64	52	1.68 <sup>d</sup>	60	1.39	29
31.....	2.24 <sup>d</sup>	216	1.34	27	.....	.....	1.63 <sup>d</sup>	50	.....	.....	1.45 <sup>g</sup>	31

a to a Ice conditions.

b to b Open water conditions.

d Estimated gauge height.

f New gauge station after June 6.

g to g Gauge height of bottom of ice, and open water curve used.

## MONTHLY DISCHARGE of Lee Creek at Layton's Ranch, for 1915.

(Drainage area 92 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	23.0	13.0	17.3	0.188	0.217	1,064
February.....	14.8	11.8	13.7	0.149	0.155	761
March.....	90.0	9.3	26.0	0.282	0.325	1,599
April.....	117.0	45.0	62.5	0.680	0.759	3,719
May.....	346.0	90.0	174.8	1.900	2.190	10,748
June.....	560.0	103.0	359.0	3.902	4.353	21,362
July.....	260.0	56.0	151.0	1.641	1.892	9,285
August.....	330.0	27.0	91.7	1.000	1.153	5,638
September.....	336.0	26.0	71.2	0.774	0.864	4,237
October.....	128.0	50.0	91.1	0.990	1.141	5,602
November.....	76.0	42.0	56.3	0.612	0.683	3,350
December.....	62.0	26.0	36.0	0.391	0.451	2,214
The year.....	.....	.....	.....	.....	14.183	69,579

## SESSIONAL PAPER No. 25c

## PINEPOUND CREEK AT PACKARD'S FARM.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 29, Tp. 4, Rge. 24, W. 4th Mer.

*Records available.*—April 30, 1914, to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at elevation of 93.00 feet since established.

*Bench-mark.*—Permanent iron bench-mark located 50 feet southeast of the staff gauge on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand, gravel and small stones, not liable to shift on account of the good control, located about 100 feet below the gauge.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—D. M. Boyd, Spring Coulee Post Office, Alta.

## DISCHARGE MEASUREMENTS of Pinepound Creek at Packard's Farm, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 2	J. E. Degnan	20.5	23.90	2.35	3.22	56.0
April 16	V. A. Newhall	17.1	6.10	0.44	2.60	2.6
May 17	do	16.2	6.97	0.52	2.60	2.6
June 4	W. A. Burton	12.2	5.05	0.85	2.62	4.3
June 24	V. A. Newhall	10.0	4.20	0.89	2.65	2.7
July 9	do	10.8	4.20	0.63	2.61	2.6
July 31	do	26.5	26.32	2.00	3.19	58.0
Sept. 7	W. A. Burton	10.7	4.38	0.56	2.63	2.4
Sept. 28	do	10.4	3.77	0.66	2.61	2.5

## DAILY GAUGE HEIGHT AND DISCHARGE of Pinepound Creek at Packard's Farm, for 1915.

DAY.	March.		April.		May.		June	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			2.85	13.5	2.94	21.0	2.59	1.8
2			2.91	18.4	2.90	17.5	2.62	2.6
3			2.86	14.3	2.86	14.3	2.63	2.9
4			2.84	12.9	2.87	15.1	2.62	2.6
5			2.76	8.5	2.63	2.0	2.64	3.2
6			2.74	7.5	2.61	2.3	2.67	4.5
7			2.71	6.0	2.62	2.6	2.72	6.5
8			2.66	3.9	2.60	2.0	2.69	5.1
9			2.64	3.2	2.60	2.0	2.70	5.5
10			2.64	3.2	2.59	1.8	2.67	4.3
11			2.62	2.6	2.60	2.0	2.68	4.7
12			2.61	2.3	2.60	2.0	2.69	5.1
13			2.59	1.8	2.59	1.8	2.68	4.7
14			2.58	1.6	2.64	3.2	2.66	3.9
15			2.60	2.0	2.68	4.7	2.69	5.1
16			2.60	2.0	2.62	2.6	2.66	3.9
17			2.59	1.8	2.60	2.0	2.67	4.5
18			2.68	1.6	2.61	2.3	2.68	4.7
19			2.56	1.2	2.59	1.8	2.68	4.7
20			2.55	1.0	2.60	2.0	2.67	4.5
21			2.53	0.6	2.59	1.8	2.65	3.5
22			2.59	1.8	2.58	1.6	2.63	3.9
23			2.55	1.0	2.50	1.8	2.64	3.5
24	3.22	57.0	2.54	0.8	2.59	1.8	2.65	3.5
25	2.95	22.0	2.52	0.4	2.58	1.6	2.64	3.5
26	2.73	7.0	2.51	0.2	2.59	1.8	3.15	46.0
27	2.65	3.5	2.50	0.0	2.60	2.0	3.03	30.0
28	2.08	4.7	3.65	183.0	2.59	1.8	3.19	72.0
29	2.71	6.0	3.40	96.0	2.60	2.0	3.17	40.0
30	2.70	10.0	3.05	32.5	2.60	2.0	3.16	48.0
31	2.83	12.3			2.61	2.3		

DAILY GAUGE HEIGHT AND DISCHARGE of Pinepound Creek at Packard's Farm, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.90	17.5	3.16	48.0	2.60	2.0	2.63	2.9
2.....	2.65	3.5	2.94	21.0	2.63	2.9	2.65	3.5
3.....	2.63	2.9	2.68	4.7	2.67	4.3	2.66	3.9
4.....	2.60	2.0	2.66	3.9	2.64	3.2	2.63	2.9
5.....	2.60	2.0	2.64	3.2	2.63	2.9	2.65	3.5
6.....	2.59	1.8	2.65	3.5	2.61	2.3	2.64	3.2
7.....	2.60	2.0	2.66	3.9	2.63	2.9	2.66	3.9
8.....	2.59	1.8	2.64	3.2	2.64	3.2	2.65	3.5
9.....	2.61	2.3	2.65	3.5	2.62	2.6	2.63	2.9
10.....	2.60	2.0	2.66	3.9	2.65	3.5	2.64	3.2
11.....	2.59	1.8	2.64	3.2	2.64	3.2	2.64	3.2
12.....	2.60	2.0	2.63	2.9	2.66	3.9	2.65	3.5
13.....	2.60	2.0	2.66	3.9	2.67	4.3	2.64	3.2
14.....	2.61	2.3	2.63	2.9	2.65	3.5	2.64	3.2
15.....	2.60	2.0	2.64	3.2	2.63	2.9	2.63	2.9
16.....	2.60	2.0	2.63	2.9	2.61	2.3	2.62	2.6
17.....	2.61	2.3	2.61	2.3	2.63	2.9	2.62	2.6
18.....	2.63	2.9	2.56	1.2	2.67	4.3	2.61	2.3
19.....	2.62	2.6	2.60	2.0	2.65	3.5	2.61	2.3
20.....	2.61	2.3	2.61	2.3	2.64	3.2	2.60	2.0
21.....	2.60	2.0	2.67	4.3	2.65	3.5	2.60	2.0
22.....	2.60	2.0	2.63	2.9	2.66	3.9	2.59	1.8
23.....	2.62	2.6	2.60	2.0	2.65	3.5	2.60	2.0
24.....	2.61	2.3	2.62	2.6	2.67	4.3	2.59	1.8
25.....	2.60	2.0	2.61	2.3	2.66	3.9	2.58	1.6
26.....	2.60	2.0	2.59	1.8	2.68	4.7	2.57	1.4
27.....	2.61	2.3	2.60	2.0	2.64	3.2	2.55	1.0
28.....	3.34	82.0	2.60	2.0	2.61	2.3	2.54	0.8
29.....	2.90	17.5	2.58	1.6	2.60	2.0	2.52	0.4
30.....	2.68	4.7	2.61	2.3	2.62	2.6	2.49	0.0
31.....	3.17	49.0	2.63	2.9			2.48	0.0

MONTHLY DISCHARGE of Pinepound Creek at Packard's Farm, for 1915.

(Drainage area *a* square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31).....	57.0	3.5	17.40			311
April.....	183.0	0.0	14.19			844
May.....	21.0	1.6	4.08			251
June.....	52.0	1.8	10.85			646
July.....	82.0	1.8	7.37			453
August.....	48.0	1.2	4.91			302
September.....	4.7	2.0	3.26			194
October.....	3.9	0.0	2.39			147
The period.....						3,148

*a* Owing to the fact that a portion of the discharge is waste water from the Alberta Railway and Irrigation Company's canal, the drainage area has not been taken out.

ALBERTA RAILWAY AND IRRIGATION COMPANY'S CANAL AT SPRING COULEE.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 28, Tp. 4, Rge. 23, W. 4th Mer.

*Records available.*—May 1, 1914, to October 11, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at elevation 87.68 feet since establishment.

## SESSIONAL PAPER No. 25c

*Bench-mark.*—Permanent iron bench-mark set 30 feet southwest of rod. Assumed elevation, 100.06 feet.

*Channel.*—Straight for 200 feet above and 100 feet below the cable. The banks are steep and high and the stream bed consists of sand, clay and small stone, liable to shift.

*Discharge measurements.*—Made from a temporary cable structure located 150 feet below the gauge.

*Observer.*—D. M. Boyd, Spring Coulee Post Office, Alta.

*Remarks.*—Records may be obtained only during the irrigating season.

## DISCHARGE MEASUREMENTS of Alberta Railway and Irrigation Company's Canal at Spring Coulee, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 17.....	V. A. Newhall.....	47.5	101.6	3.54	3.93	360
June 4.....	W. A. Burton.....	47.5	98.0	3.66	3.92	359
June 24.....	V. A. Newhall.....	48.0	97.3	3.27	3.62	318
July 9.....	do.....	46.5	76.7	2.89	3.22	221
July 31.....	do.....	45.5	63.8	2.75	2.94	176
Sept. 7.....	do.....	45.5	68.1	2.82	3.08	192
Sept. 28.....	W. A. Burton.....	47.0	84.5	3.10	3.32	262

## DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's Canal at Spring Coulee, for 1915.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.10	233	3.85	349
2.....	3.20	247	3.88	354
3.....	3.19	246	3.89	355
4.....	3.34	267	3.92	360
5.....	3.50	293	3.99	371
6.....	3.49	291	3.94	363
7.....	3.48	290	3.91	359
8.....	3.49	291	3.92	360
9.....	3.50	293	3.80	341
10.....	3.48	290	3.79	339
11.....	3.40	291	3.65	317
12.....	3.48	290	3.74	331
13.....	3.49	291	3.69	323
14.....	3.56	303	3.72	328
15.....	3.67	320	3.75	333
16.....	3.84	347	3.77	336
17.....	3.93	362	3.69	323
18.....	3.92	360	3.71	327
19.....	3.84	347	3.70	325
20.....	3.78	338	3.69	323
21.....	3.76	335	3.65	317
22.....	3.92	360	3.60	309
23.....	3.90	357	3.59	307
24.....	3.87	352	3.62	312
25.....	3.86	350	3.50	290
26.....	3.85	349	2.61	360
27.....	3.84	347	2.00d	88
28.....	3.83	346	3.10	225
29.....	3.87	352	3.05	217
30.....	3.84	347	3.04	214
31.....	3.74	331		

Water in canal from April 28 to April 30 but not up to base of rod.

c to c Shifting conditions.

d Estimated gauge height.

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's Canal at Spring Coulee, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.07c	216	2.90	168	3.04	190	3.32	264
2.....	3.25	240	2.85	160	3.02	187	3.28	258
3.....	3.38	256	3.09	198	3.16	210	3.31	263
4.....	3.34	248	3.02	187	3.17	211	3.32	264
5.....	3.33	244	3.03	189	3.12	203	3.35	269
6.....	3.32	242	3.08	197	3.09	198	3.33	266
7.....	3.22	225	3.06	194	3.08c	197	3.31	263
8.....	3.24	224	3.05	192	3.09	200	3.32	264
9.....	3.22c	220	3.07	195	3.07	198	3.06	227
10.....	3.23	221	3.09	198	3.07	199	2.94	211
11.....	3.20	216	3.06	194	3.09	204	2.90	205
12.....	3.21	218	3.09	198	3.08	206	Water below zero. from Oct. 12th to Oct. 31st	
13.....	3.20	216	3.12	203	3.10	208		
14.....	3.24	222	3.08	197	3.29	240		
15.....	3.21	218	3.06	194	3.28	240	...	...
16.....	3.22	219	3.07	195	3.26	238	...	...
17.....	3.25	224	3.03	189	3.24	220	...	...
18.....	3.28	229	3.04	190	3.35	256	...	...
19.....	3.24	222	3.05	192	3.32	252	...	...
20.....	3.24	222	3.06	194	3.29	248	...	...
21.....	3.23	221	3.12	203	3.29	250	...	...
22.....	3.22	219	3.07	195	3.28	249	...	...
23.....	3.21	218	3.05	192	3.27	249	...	...
24.....	3.23	221	3.06	194	3.30	256	...	...
25.....	3.22	219	3.04	190	3.28	254	...	...
26.....	3.25	224	3.03	189	3.25	250	...	...
27.....	3.24	222	3.01	186	3.24	249	...	...
28.....	4.09	365	3.02	187	3.32c	264	...	...
29.....	3.20	216	3.04	190	3.30	261	...	...
30.....	3.05	192	3.05	192	3.31	263	...	...
31.....	2.94	174	3.06	194	...	...	...	...

c to c Shifting conditions.

## MONTHLY DISCHARGE of Alberta Railway and Irrigation Company's Canal at Spring Coulee, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (28-30).....	...	...	...	...
May.....	362	233	317	19,467
June.....	363	88	315	18,756
July.....	365	174	227	13,952
August.....	203	160	192	11,775
September.....	264	189	228	13,585
October (1-12).....	269	205	250	5,160
The period.....	...	...	...	82,995

Water in canal April 28 to 30, but not touching rod.  
Water in canal below rod from October 12 to 31.



## SESSIONAL PAPER No. 25c

## POTHOLE CREEK NEAR MAGRATH (UPPER STATION).

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 10, Tp. 5, Rge. 22, W. 4th Mer., three and one-half miles southwest of Magrath.

*Records available.*—April 27, 1914, to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at elevation of 92.68 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark, located on the right bank thirty feet south of the staff gauge. Assumed elevation, 100.00 feet.

*Channel.*—Straight for about 100 feet above and 50 feet below gauge, composed of fine gravel and stones and liable to shift during floods.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—L. A. Harrison.

## DISCHARGE MEASUREMENTS of Pothole (Upper Station) Creek near Magrath, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 20	J. E. Degnan	36.0	34.0	1.70	2.170	57.00
April 15	V. A. Newhall	9.0	6.0	1.50	1.185	9.00
May 13	do	8.0	3.3	0.75	0.950	2.50
June 4	do	46.5	109.1	2.13	4.200	233.00
June 25	do	14.5	6.8	2.21	1.310	15.00
July 8	do	8.7	5.8	1.41	1.150	8.20
July 30	do	40.5	44.2	2.40	2.585	106.00
Sept. 6	W. A. Burton	14.5	6.9	1.90	1.250	13.10
Sept. 28	V. A. Newhall	8.6	4.6	1.48	1.080	6.50

## DAILY GAUGE HEIGHT AND DISCHARGE of Pothole (Upper Station) Creek near Magrath, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.90	41.0	0.96	3.1	0.92	2.2
2			2.01	48.0	1.01	4.3	1.80	35.0
3			2.05	50.0	1.04	5.0	5.45	348.0
4			2.09	53.0	1.03	4.8	4.20	235.0
5			1.65	27.0	1.01	4.3	5.20	325.0
6			1.56	22.0	1.05	5.3	3.60	181.0
7			1.47	18.8	1.12	7.2	2.20	61.0
8			1.41	16.4	1.08	6.1	1.90	41.0
9			1.30	12.5	1.05	5.3	1.86	39.0
10			1.20	9.5	1.00	4.0	1.77	33.0
11			1.18	8.9	0.95	2.9	1.60	24.0
12			1.15	8.0	0.90	1.8	1.45	18.0
13			1.20	9.5	0.85	1.3	1.48	19.2
14	2.50	85.0	1.19	9.2	0.95	2.9	1.50	20.0
15	3.50	172.0	1.14	7.7	2.10	54.0	1.55	22.0
16	5.10	316.0	1.12	7.2	1.90	41.0	1.56	22.0
17	6.01	398.0	1.12	7.2	2.90	118.0	1.58	24.0
18	4.75	284.0	1.14	7.7	2.41	78.0	1.57	23.0
19	3.50	172.0	1.05	5.3	1.72	30.0	3.05	132.0
20	2.25	65.0	1.03	4.5	1.61	25.0	2.02	48.0
21	3.09	135.0	1.02	4.5	1.42	16.8	1.35	14.0
22	4.00	217.0	1.00	4.0	1.35	14.0	1.39	15.6
23	3.90	208.0	1.00	4.0	1.32	13.1	1.30	12.5
24	3.10	136.0	0.99	3.8	1.28	11.9	1.32	13.1
25	2.99	126.0	0.98	3.6	1.22	10.1	3.25	150.0
26	2.23	63.0	0.96	3.1	1.20	9.5	2.90	118.0
27	1.83	37.0	0.94	2.7	1.15	8.0	2.85	114.0
28	1.50	20.0	0.92	2.2	1.10	6.6	2.87	116.0
29	1.50	20.0	0.90	1.8	1.02	4.5	2.36	74.0
30	1.59	24.0	0.91	2.0	0.96	3.1	2.00	47.0
31	1.67	28.0			0.94	2.7		

DAILY GAUGE HEIGHT AND DISCHARGE of Pothole (Upper Station) Creek near Magrath, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.71	30.0	1.55	22.0	0.95	2.9	0.22	0.00
2.....	1.65	27.0	1.49	19.6	0.90	1.8	0.35	0.00
3.....	1.61	25.0	1.47	18.8	1.00	4.0	0.34	0.00
4.....	1.57	23.0	1.41	16.4	1.00	4.0	0.34	0.00
5.....	1.41	16.4	1.33	13.4	1.00	4.0	0.33	0.00
6.....	1.25	11.0	1.29	12.2	1.25	11.0	0.32	0.00
7.....	1.20	9.5	1.23	10.4	1.00	4.0	0.32	0.00
8.....	1.15	8.0	1.10	6.6	1.00	4.0	0.31	0.00
9.....	1.10	6.6	1.04	5.0	1.00	4.0	0.31	0.00
10.....	1.05	5.3	1.00	4.0	1.05	5.3	0.30	0.00
11.....	1.04	5.0	1.01	4.3	1.10	6.6	0.30	0.00
12.....	1.05	5.3	0.98	3.6	1.10	6.6	0.35	0.00
13.....	1.06	5.6	0.98	3.6	1.15	8.0	0.32	0.00
14.....	1.05	5.3	1.00	4.0	1.20	9.5	0.31	0.00
15.....	1.06	5.6	1.01	4.3	1.20	9.5	0.31	0.00
16.....	1.06	5.6	2.00	47.0	1.25	11.0	0.30	0.00
17.....	1.07	5.8	2.00	47.0	1.25	11.0	0.29	0.00
18.....	1.09	6.3	1.95	44.0	1.40	16.0	0.32	0.00
19.....	1.12	7.2	1.91	42.0	1.30	12.5	0.35	0.00
20.....	1.15	8.0	1.85	38.0	1.27	11.6	0.38	0.00
21.....	1.15	8.0	1.54	22.0	1.23	10.4	0.41	0.00
22.....	1.14	7.7	1.20	9.5	1.19	9.2	0.44	0.04
23.....	1.15	8.0	1.20	9.5	1.08	6.1	0.47	0.07
24.....	1.15	8.0	1.10	6.6	0.96	3.1	0.51	0.11
25.....	1.17	8.6	1.10	6.6	0.84	1.2	0.53	0.13
26.....	1.18	8.9	1.00	4.0	0.72	0.5	0.55	0.15
27.....	1.48	19.2	1.00	4.0	0.65	0.3	0.58	0.18
28.....	1.97	45.0	1.00	4.0	1.08	6.1	0.60	0.20
29.....	2.56	90.0	1.00	4.0	0.28	0.0	0.63	0.26
30.....	2.70	101.0	0.95	2.9	0.26	0.0	0.64	0.28
31.....	1.85	38.0	0.95	2.9	.....	.....	0.66	0.32

## MONTHLY DISCHARGE of Pothole (Upper Station) Creek near Magrath, for 1915.

(Drainage area 162 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (14-31).....	398.00	20.0	139.00	0.8590	0.5700	4,969
April.....	53.00	1.8	13.50	0.0830	0.0930	804
May.....	118.00	1.3	16.30	0.1010	0.1160	1,001
June.....	348.00	2.2	77.50	0.4790	0.5340	4,613
July.....	101.00	5.0	18.20	0.1120	0.1290	1,119
August.....	47.00	2.9	19.80	0.1220	0.1410	1,216
September.....	16.00	0.0	6.10	0.0380	0.0420	365
October.....	0.32	0.0	0.06	0.0003	0.0004	3
The period.....					1.6254	14,090

## POTHOLE CREEK NEAR MAGRATH (LOWER STATION).

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 1, Tp. 6, Rge. 22, W. 4th Mer., three miles northeast of Magrath.

*Records available.*—April 28, 1914, to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at elevation of 92.87 feet from April 28 to July 13, 1914. Gauge moved 336 feet downstream on July 13. Zero of gauge maintained at elevation of 93.42 feet since that date.

## SESSIONAL PAPER No. 25c

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet, located on the left bank 50 feet from the staff.

*Channel.*—Composed of sand, gravel and clay, liable to shift during floods.

*Discharge measurements.*—Made by wading.

*Floods.*—Caused by overflow from Alberta Railway and Irrigation Company's Canal.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—R. Hyden.

## DISCHARGE MEASUREMENTS of Pothole Creek near Magrath (Lower Station), in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 20.	J. E. Degnan	54.0	41.0	1.84	2.230	76.0
April 15.	V. A. Newhall	28.3	9.9	0.89	1.500	8.8
May 13.	do	41.5	27.4	1.86	1.920	52.0
June 4.	do	96.2	182.6	3.15	4.155	576.0
June 23.	do	65.0	67.9	2.17	2.820	147.0
July 8.	do	64.5	57.1	2.00	2.650	114.0
July 30.	do	69.0	88.6	2.95	3.130	261.0
Sept. 6.	W. A. Burton	51.0	40.7	1.92	2.420	78.0
Sept. 28.	V. A. Newhall	51.9	35.7	1.74	2.230	62.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Pothole Creek near Magrath (Lower Station), for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.85	38.0	2.30	85.0	2.52	119.0
2			1.85	38.0	2.21d	73.0	2.53	120.0
3			2.05	56.0	2.13	64.0	3.34d	522.0
4			1.92d	44.0	2.12d	63.0	4.16c	577.0
5			1.80	34.0	2.12	63.0	4.00	520.0
6			1.75	30.0	2.13	64.0	3.64d	394.0
7			1.72	28.0	1.95	46.0	3.28d	274.0
8			1.68d	25.0	1.90	42.0	2.92	170.0
9			1.65	23.0	1.88d	40.0	2.93	173.0
10			1.55	17.0	1.85	38.0	2.94d	175.0
11			1.54d	16.4	1.90d	42.0	2.95	178.0
12			1.54	16.4	1.95	46.0	2.85	153.0
13			1.53	15.8	2.00	51.0	2.85d	153.0
14			1.53	15.8	2.45	107.0	2.85	153.0
15	2.50	115.0	1.50	14.0	2.64d	141.0	2.85	153.0
16	3.00	225.0	1.50	14.0	2.84d	185.0	2.90d	165.0
17	4.50	686.0	1.50	14.0	3.03	233.0	2.95	178.0
18	4.50	686.0	1.45d	11.0	2.88d	194.0	2.94d	175.0
19	2.40	99.0	1.40d	8.0	2.73	160.0	2.94	175.0
20	2.23	76.0	1.35	6.0	2.52d	119.0	2.88d	160.0
21	2.56d	126.0	1.35	6.0	2.30	85.0	2.83d	148.0
22	2.90	199.0	1.34	5.6	2.29	84.0	2.77	134.0
23	2.92	204.0	1.34	5.6	2.34d	91.0	2.84	151.0
24	2.95	212.0	1.34	5.6	2.40	99.0	2.80d	141.0
25	2.61d	135.0	1.34	5.6	2.55	124.0	2.76	133.0
26	2.27	81.0	1.29	3.6	2.54d	122.0	4.00	520.0
27	1.45	11.0	1.28	3.2	2.53	120.0	3.50d	346.0
28	1.58d	18.8	1.09d	25.0	2.50d	126.0	3.00d	191.0
29	1.70	26.0	2.10	61.0	2.58	129.0	2.50	87.0
30	1.75	30.0	2.40	99.0	2.56d	126.0	2.30c	67.0
31	1.80d	34.0			2.53	120.0		

c to c Shifting conditions.

d Estimated gauge height.

DAILY GAUGE HEIGHT AND DISCHARGE of Pothole Creek near Magrath (Lower Station),  
for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.54 <i>c</i>	93	2.95 <i>d</i>	204	2.00	50	2.40	76
2.....	2.55	94	2.90 <i>d</i>	189	2.30 <i>d</i>	67	2.45	81
3.....	2.53 <i>d</i>	91	2.85	173	2.60	101	2.45 <i>d</i>	81
4.....	2.52 <i>d</i>	90	2.85 <i>d</i>	172	2.49 <i>d</i>	86	2.45	81
5.....	2.50	87	2.85	171	2.38 <i>d</i>	74	2.50	87
6.....	2.85	153	2.65	123	2.27	65	2.72 <i>d</i>	123
7.....	2.7 <i>cd</i>	132	2.60	122	2.10	54	2.95	178
8.....	2.68 <i>c</i>	115	2.55 <i>d</i>	102	2.10 <i>d</i>	54	2.98 <i>d</i>	186
9.....	2.64 <i>d</i>	108	2.50	93	2.10	54	3.00	191
10.....	2.60	103	2.50 <i>d</i>	92	2.14 <i>d</i>	56	2.65 <i>d</i>	110
11.....	2.60 <i>d</i>	103	2.49	89	2.18	59	2.30 <i>d</i>	67
12.....	2.60	104	2.39	76	2.17 <i>d</i>	58	1.95	48
13.....	2.60 <i>d</i>	104	2.44 <i>dc</i>	80	2.17 <i>d</i>	58	1.95	48
14.....	2.60	105	2.50	87	2.16	58	1.85 <i>d</i>	44
15.....	2.60 <i>d</i>	105	2.50 <i>d</i>	87	2.16	58	1.75	42
16.....	2.60	106	2.50	87	2.02 <i>d</i>	51	1.75	42
17.....	3.00	260	2.95	178	1.87	45	1.75 <i>d</i>	42
18.....	2.98 <i>d</i>	196	2.90 <i>d</i>	165	1.87	45	1.75	42
19.....	2.95	190	2.85	153	1.85 <i>d</i>	45	1.70 <i>d</i>	41
20.....	2.75	142	2.72 <i>d</i>	123	1.90	46	1.65	40
21.....	2.75	142	2.60	101	1.90 <i>d</i>	46	1.65 <i>d</i>	40
22.....	2.70 <i>d</i>	132	2.40 <i>d</i>	76	1.90	46	1.65	40
23.....	2.65	132	2.20	60	2.00 <i>d</i>	50	1.60	39
24.....	2.65 <i>d</i>	133	2.15 <i>d</i>	57	2.10	54	1.60 <i>d</i>	39
25.....	2.65 <i>d</i>	135	2.10	54	2.10	54	1.60	39
26.....	2.65	136	2.10 <i>d</i>	54	2.14 <i>d</i>	56	1.55	38
27.....	2.65	138	2.10	54	2.19 <i>d</i>	59	1.52 <i>d</i>	38
28.....	3.12 <i>d</i>	254	2.10	54	2.23	62	1.50	38
29.....	3.60	400	2.10 <i>d</i>	54	2.32 <i>d</i>	69	1.50 <i>d</i>	38
30.....	3.13 <i>c</i>	260	2.10	54	2.40	76	1.50	38
31.....	3.00	221	2.10	54	.....	.....	1.50 <i>d</i>	38

*c-c* Shifting conditions.*d* Estimated gauge height.

## MONTHLY DISCHARGE of Pothole Creek near Magrath (Lower Station), for 1915.

(Drainage area *a* square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.			Total Discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
March (15-31).....	686	11.0	174.3	5,877
April.....	99	3.2	22.8	1,358
May.....	233	38.0	99.4	6,113
June.....	577	67.0	213.5	12,702
July.....	400	87.0	147.2	9,053
August.....	204	54.0	104.4	6,422
September.....	101	45.0	58.5	3,483
October.....	191	38.0	67.0	4,120
The period.....				49,128

*a* Owing to the greater part of the discharge being waste water from the Alberta Railway Irrigation Company's canal, the drainage area has not been taken out.

## ST. MARY RIVER AT WHITNEY'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 26, Tp. 7, Rge. 22, W. 4th Mer.

*Records available.*—October 13, 1911, to December 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 87.55 feet during 1911; zero of gauge maintained at 89.13 feet during 1912; zero of gauge maintained at 89.15 feet during 1913; zero of gauge maintained at 88.15 feet during 1914–15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet, located near Mr. Whitney's house.

*Channel.*—Consists of gravel and is liable to shift.

*Discharge measurements.*—Made from a cable car located about 2,000 feet downstream from the gauge.

*Winter flow.*—Obtained through the ice 240 feet downstream from the cable.

*Observer.*—W. D. Whitney.

## DISCHARGE MEASUREMENTS of St. Mary River at Whitney's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 12.....	O. H. Hoover.....	101	117	1.51	1.84	177
Jan. 27.....	J. E. Degnan.....	101	144	1.36	1.89	195
Feb. 12.....	do.....	92	125	1.49	2.20	185
Mar. 3.....	do.....	94	110	1.25	2.14	138
Mar. 18.....	P. H. Daniells.....	260	513	3.84	2.42	1,969
April 3.....	do.....	185	228	2.18	1.33	497
April 15.....	do.....	184	227	2.24	1.29	509
April 30.....	do.....	203	323	2.74	1.60	884
May 13.....	W. R. McCaffrey.....	265	496	4.12	2.06	1,882
May 27.....	do.....	233	392	3.16	1.82	1,238
June 8.....	do.....	295	650	4.25	2.39	2,762
June 22.....	do.....	248	575	4.08	2.23	2,346
June 27.....	J. E. Degnan.....	312	773	4.71	2.57	3,642
June 29.....	do.....	297	674	4.41	2.37	2,887
July 13.....	W. R. McCaffrey.....	287	492	3.48	1.97	1,711
July 23.....	do.....	254	413	3.10	1.80	1,283
Aug. 11.....	G. H. Whyte and W. R. McCaffrey.....	233	349	2.82	1.67	1,346
Aug. 24.....	W. R. McCaffrey.....	228	269	2.67	1.65	1,064
Sept. 21.....	do.....	217	260	2.70	1.57	889
Oct. 8.....	W. H. Hannon.....	219	315	3.92	1.72	1,236
Oct. 27.....	W. R. McCaffrey.....	205	229	2.42	1.46	784
Nov. 22.....	W. H. Storey.....	181	279	2.40	1.45	686
Dec. 15.....	do.....	164	134	1.93	1.52	239

## DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary River at Whitney's Ranch, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.05s	235	1.90	181	2.05	155	1.37	569	1.65a	990	1.88	1,446
2.....	2.08	230	1.91	182	2.05	146	1.33	525	1.70	1,080	1.89	1,468
3.....	1.87	220	1.94	181	2.14	138	1.34	534	1.70	1,080	1.99	1,704
4.....	1.95	200	1.95	176	2.17	140	1.40	605	2.00	1,730	2.95	5,220
5.....	1.90	181	2.05	184	2.20	157	1.40	605	2.00	1,730	2.60	3,770
6.....	1.88	163	1.97	195	2.24	176	1.35	545	2.00	1,730	2.69	4,130
7.....	1.95	165	1.98	199	2.20	207	1.31	501	1.95	1,600	2.42	3,076
8.....	1.95	172	1.99	206	2.24	226	1.34	534	1.95	1,600	2.35	2,815
9.....	1.89	178	2.02	203	2.26	252	1.30	490	1.98	1,678	2.29	2,600
10.....	1.97	180	2.06	212	2.26	283	1.28	468	2.05	1,860	2.25	2,460
11.....	1.90	179	2.16	205	2.28	324	1.28	468	2.05	1,860	2.24	2,427
12.....	1.87	178	2.18	183	2.36	375	1.28	468	2.08	1,938	2.24	2,427
13.....	1.87	175	2.00	164	2.38	420	1.28	468	2.06	1,886	2.21	2,328
14.....	1.82	172	2.10	178	2.36	590	1.28	468	2.20	2,295	2.18	2,233
15.....	1.87	167	2.15	191	2.38	790	1.29	479	2.23	2,394	2.31	2,671
16.....	1.87	169	2.17	198	2.65	1,120	1.37	569	2.30	2,635	2.38	2,926
17.....	1.82	157	2.18	203	2.60d	1,500	1.39	593	2.38	2,926	2.33	2,743
18.....	1.70	150	2.17	207	2.65b	1,970	1.45	675	2.29	2,600	2.28	2,565
19.....	1.80	170	2.17	208	2.65	1,970	1.48	717	2.24	2,427	2.28	2,565
20.....	1.80	176	2.18	202	2.65bc	1,980	1.55	820	2.15	2,140	2.38	2,926
21.....	1.85	170	2.16	190	2.10m	1,990	1.60	900	2.12	2,050	2.28	2,565
22.....	1.82	168	2.15	178	1.95	1,600	1.65	990	1.95	1,600	2.23	2,394
23.....	1.82	170	2.15	175	2.00	1,730	1.70	1,080	1.90	1,490	2.21	2,328
24.....	1.83	180	2.14	173	2.00	1,730	1.69	1,062	1.85	1,380	2.18	2,233
25.....	1.84	190	2.13	171	1.95	1,600	1.69	1,062	1.85	1,380	2.15	2,140
26.....	1.88	195	2.12	168	1.85	1,380	1.65	990	1.85	1,380	2.59	3,730
27.....	1.89	195	2.11	163	1.76	1,200	1.65	990	1.82	1,320	2.58	3,690
28.....	1.87	186	2.11	158	1.70	1,080	1.65	990	1.80	1,280	2.48	3,304
29.....	1.88	169	.....	.....	1.60	900	1.65	990	1.80	1,280	2.38	2,926
30.....	1.89	167	.....	.....	1.57	852	1.60	900	1.83	1,340	2.28	2,565
31.....	1.90	179	.....	.....	1.55	820	.....	.....	1.85	1,380	.....	.....

a Interpolated.

b to b Ice down stream from gauge.

d Ice gone from gauge.

s to c Ice conditions, Jan. 1 to March 20 (incl.).

m Open water, March 21.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary River at Whitney's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.39	2,963	2.07	1,912	1.44	756	1.34	616	1.47	802	1.47	550
2.....	2.30	2,635	1.97	1,652	1.43	742	1.32	588	1.47	802	1.48	522
3.....	2.32	2,707	1.87	1,424	1.45	770	1.32	588	1.47	802	1.53	500
4.....	2.27	2,530	1.82	1,320	1.47	802	1.34	616	1.44	756	1.53	480
5.....	2.23	2,394	1.77	1,220	1.77	1,330	1.34	616	1.46	786	1.48	455
6.....	2.15	2,140	1.76	1,200	1.97	1,764	1.51	866	1.47	802	1.48	425
7.....	2.15	2,140	1.73	1,140	1.72	1,230	1.67	1,136	1.48	818	1.49	400
8.....	2.14	2,110	1.73	1,140	1.63	1,064	1.72	1,230	1.48	818	1.49	380
9.....	2.13	2,080	1.71	1,100	1.57	962	1.72	1,230	1.48	818	1.48	355
10.....	2.11	2,020	1.70	1,080	1.55	930	1.70	1,190	1.48	818	1.47	328
11.....	2.07	1,912	1.67	1,026	1.57	962	1.71	1,210	1.47	802	1.45	313
12.....	2.04	1,834	1.65	995 <sup>a</sup>	1.57	962	1.73	1,250	1.47	802	1.48	295
13.....	2.07	1,912	1.62	952	1.55	930	1.73	1,250	1.46	786	1.51	279
14.....	1.94	1,578	1.60	925	1.55	930	1.73	1,250	1.45	770	1.51	266
15.....	1.91	1,512	1.60	934	1.52	882	1.67	1,136	1.43	742	1.53	259
16.....	1.91	1,512	1.60	943	1.48	818	1.67	1,136	1.43	742	1.53	263
17.....	1.87	1,424	1.60	952	1.46	786	1.66	1,118	1.43	742	1.54	274
18.....	1.90	1,490	1.60	961	1.44	756	1.62	1,048	1.43	742	1.54	285
19.....	1.97	1,652	1.59	950	1.42	728	1.62	1,046	1.44	756	1.58	300
20.....	1.92	1,534	1.57	928	1.47	802	1.57	962	1.43	742	1.68	310
21.....	1.87	1,424	1.57	935	1.58	978	1.52	882	1.42 <sup>c</sup>	705	1.79	317
22.....	1.84	1,360	1.59	975	1.55	930	1.51	866	1.41	685	1.79	318
23.....	1.80	1,250	1.60	1,000 <sup>b</sup>	1.53	898	1.49	834	1.41	678	1.80	316
24.....	1.72	1,120	1.63	1,064	1.50	850	1.48	818	1.40	672	1.75	302
25.....	1.71	1,100	1.61	1,028	1.51	866	1.47	802	1.40	666	1.76	288
26.....	1.73	1,140	1.57	962	1.51	866	1.47	802	1.40	657	1.71	272
27.....	1.87	1,424	1.52	882	1.48	818	1.46	786	1.41	647	1.62	255
28.....	2.25	2,460	1.47	802	1.45	770	1.46	786	1.43	635	1.62	238
29.....	3.07	5,724	1.44	756	1.42	728	1.44	756	1.44	609	1.58	210
30.....	2.27	2,530	1.44	756	1.37	658	1.44	756	1.47	580	1.60	185
31.....	2.13	2,080	1.44	756			1.47	802			1.58 <sup>d</sup>	155

<sup>a</sup> to <sup>b</sup> Change of stage.

<sup>c</sup> to <sup>d</sup> Ice conditions, Nov. 21 to Dec. 31 (incl.)

## MONTHLY DISCHARGE of St. Mary River at Whitney's Ranch, for 1915.

(Drainage area 1,394 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	235	150	180	0 120	0 149	11,068
February.....	212	158	186	0 133	0 138	10,330
March.....	1,990	138	897	0 643	0 741	55,134
April.....	1,080	408	705	0 306	0 564	41,950
May.....	2,926	990	1,744	1 250	1 441	107,130
June.....	5,220	1,446	2,744	1 970	2 198	163,280
July.....	5,724	1,100	1,959	1 410	1 626	120,520
August.....	1,912	756	1,054	0 756	0 872	64,581
September.....	1,704	658	909	0 652	0 737	54,089
October.....	1,250	588	934	0 670	0 773	57,429
November.....	818	580	739	0 530	0 591	43,974
December.....	550	155	326	0 234	0 270	20,045
The year.....					10 089	749,580



## MILK RIVER DRAINAGE BASIN.

*General Description.*

Milk River rises on the eastern slope of the foothills on the Blackfoot Indian Reserve in the United States. Its headwaters run down in two main streams, which are known, after entering Canada, as the north and south branches.

The north branch flows in a northeasterly direction through the Blackfoot Reserve for a distance of about fifteen miles, and then enters Canada near the quarter-mound on the south side of Section 3, Township 1, Range 23, West of the 4th Meridian. From the international boundary the north branch continues in a northeasterly direction for about nine miles, when it bends to the east and runs in an easterly direction through the second tier of township to its junction with the south branch at the centre of Section 20, Township 2, Range 18, West of the 4th Meridian.

The south branch runs to the south and east of, and parallels the north branch for a distance of about forty-eight miles, as the crow flies, through the Blackfoot Reserve, and then enters Canada near the quarter-mound on the south side of Section 1, Township 1, Range 20, West of the 4th Meridian. From the international boundary it flows in a northeasterly direction to its junction with the north branch.

From the confluence of the two branches, Milk River flows in an easterly direction through the second tier of townships in Canada to the east boundary of Range seven. From this point the river flows in a southeasterly direction to its first point of crossing the international boundary into the United States. This first point of crossing is near the quarter-mound on the south side of Section 3, Township 1, Range 5, West of the 4th Meridian. From this point the river meanders in an easterly direction through Canada and the United States, to a point on the international boundary about 900 feet west of the east boundary of Section 1, Township 1, Range 5, West of the 4th Meridian, where it finally crosses into the United States. This point is known as the "Eastern Crossing." The length of the course of the Milk River in Canada from the western crossing of the north branch to the eastern crossing is about 180 miles. The length of the course of the south branch in Canada is fourteen miles.

Throughout its course in Canada, from the western crossing of the north branch to the eastern crossing, Milk River flows through a well defined valley bordered on the east side by a range of hills. The whole of its watershed in Canada is treeless prairie land, the last forty miles of river flat being, however, well wooded. The river receives a number of small tributary creeks along its course, all of which discharge a considerable volume of water during the spring freshets; usually they all dry up about July 1, and have no considerable discharge again until late in the fall, when some of them have a small flow for perhaps a month before the freeze-up.

The general conditions of flow in the river are such as are typical of all rivers which have a watershed devoid of tree growth; that is, it is subject to extreme floods during the freshet period, and to correspondingly low flow during the summer months.

## NORTH BRANCH OF MILK RIVER AT PETERS' RANCH.

*Location.*—NE.  $\frac{1}{4}$  Sec. 11, Tp. 1, Rge. 23, W. 4th Mer.

*Records available.*—July 21, 1909, to December 31, 1915.

*Gauges.*—Stevens automatic gauge used during open water. Vertical staff used during ice conditions. Zero of gauges maintained at elevation 4,110.45 feet during 1913-14-15.

*Bench-mark.*—Permanent iron. Elevation, 4,116.87 feet above mean sea level. (Irrigation surveys 1914 datum.)

*Channel.*—Permanent.

*Discharge measurements.*—Made by wading at low stages and from a cable car two miles below at flood periods.

*Winter flow.*—Obtained through the ice 750 feet below the gauge.

*Observer.*—Wm. Wheeler, Taylorville P.O., Alta.

*Remarks.*—Location of station and gauge datum prior to 1913 may be obtained in previous reports.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of North Branch of Milk River at Peters' Ranch, in 1915.

DATE.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 1.....	O. H. Hoover.....	16	10.8	1.42	2.11	15.4
Jan. 22.....	J. E. Degnan.....	16	12.0	1.36	2.27	16.3
Feb. 10.....	do.....	15	13.9	1.18	2.48	16.4
Feb. 25.....	do.....	16	14.6	1.20	1.91	17.5
Mar. 16.....	do.....	41	67.0	1.67	3.23	112.0
Mar. 16.....	do.....	22	76.0	2.16	3.46	166.0
Mar. 17.....	do.....	21	63.0	1.52	2.95	96.0
Mar. 26.....	do.....	19	28.3	1.35	1.95	38.0
April 21.....	V. A. Newhall.....	24	20.9	1.50	1.82	32.0
April 25.....	W. A. Lamb (U.S.G.S.).....	28	18.9	1.31	1.76	25.0
May 7.....	V. A. Newhall.....	22	19.5	1.66	1.84	32.0
May 9.....	do.....	22	17.4	1.52	1.76	26.0
May 27.....	W. A. Lamb (U.S.G.S.).....	30	18.4	1.36	1.76	25.0
June 16.....	V. A. Newhall.....	38	40.8	2.21	2.33	90.0
June 17.....	do.....	38	38.6	2.23	2.30	86.0
June 17.....	do.....	38	38.4	2.15	2.24	83.0
June 18.....	do.....	50	66.6	2.36	2.74	159.0
July 14.....	B. E. Jones (U.S.G.S.).....	30	38.0	2.11	2.26	80.0
July 14.....	do.....	28	26.0	3.08	2.26	80.0
July 14.....	V. A. Newhall.....	21	47.9	1.72 <sup>a</sup>	2.27	83.0
July 14.....	do.....	21	47.5	1.72 <sup>a</sup>	2.25	82.0
July 15.....	do.....	21	46.0	1.63 <sup>a</sup>	2.21	75.0
Aug. 4.....	do.....	22	45.9	1.52 <sup>a</sup>	2.20	70.0
Aug. 9.....	W. A. Lamb and J. C. Hoyt (U.S.G.S.).....	35	34.0	1.79	2.13	61.0
Aug. 18.....	V. A. Newhall.....	21	42.8	1.34 <sup>a</sup>	2.10	57.0
Aug. 30.....	do.....	21	40.0	1.26 <sup>a</sup>	2.05	50.0
Oct. 8.....	do.....	21	50.1	1.68 <sup>a</sup>	2.34	84.0
Nov. 11.....	W. H. Storey.....	21	46.6	0.84	2.43 <sup>b</sup>	39.0
Dec. 6.....	do.....	26	54.3	1.04	2.06	56.0
Dec. 7.....	do.....	26	52.1	0.85	1.97	44.0
Dec. 23.....	do.....	21	32.5	1.22	2.02	40.0

<sup>a</sup> Cross-section for measuring 300 feet below gauge house.<sup>b</sup> Ice formed on control, about 0.40 backwater on gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Milk River at Peters' Ranch, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.18 <sup>a</sup>	15.5	2.58	16.8	1.90	19.1	2.29	86	2.14	63	1.78	26
2.	2.20	15.6	2.50	16.8	1.93	19.2	2.94	190	1.90	36	1.96	42
3.	2.20	15.8	2.37	16.8	2.03	19.3	2.27	82	1.78	26	2.89	181
4.	2.10 <sup>c</sup>	16.0	2.36	16.8	2.00	19.8	2.07	54	1.75	24	3.01	202
5.	1.99	15.5	2.32	16.8	1.97	21.0	2.00	46	1.83	30	3.10	217
6.	1.99	14.9	2.38	16.7	1.98	21.0	1.98	44	1.80	28	2.53	124
7.	1.97	14.9	2.41	16.6	2.12	21.0	1.99	45	1.84	31	2.31	89
8.	1.94 <sup>c</sup>	15.0	2.44	16.5	2.26	22.0	1.90	36	1.82	29	2.31	89
9.	1.91	15.5	2.44	16.4	2.24	21.0	1.86	33	1.78	26	2.22	75
10.	1.89	16.0	2.48	16.5	2.14 <sup>c</sup>	21.0	1.86	33	1.77	25	3.10	217
11.	1.88	16.4	2.35	16.5	2.03	21.0	1.86	33	1.74	23	2.50	119
12.	2.13	16.5	2.21	16.7	2.18	22.0	1.91	37	1.72	22	2.34	93
13.	2.15	16.2	2.02	17.0	2.26 <sup>c</sup>	36.0	1.91	37	1.88	35	2.26	81
14.	2.10	15.8	2.09	17.1	2.34	60.0	1.93	39	2.23	76	2.43	108
15.	2.09	15.3	2.13	17.2	2.46	85.0	1.90	36	2.30	87	2.37	98
16.	2.07	15.2	2.09	17.2	3.23 <sup>a</sup>	139.0	1.89	36	2.23	76	2.36	97
17.	2.03	15.6	2.15	17.2	2.87 <sup>b</sup>	178.0	1.87	34	2.28	84	2.40	103
18.	2.40	15.8	2.11	17.2	2.81	169.0	1.85	32	2.07	54	2.71	153
19.	2.43	16.0	2.02	17.5	2.61	137.0	1.83	30	1.98	44	2.50	119
20.	2.44 <sup>c</sup>	16.2	1.98	17.6	2.53	124.0	1.81	28	1.90	36	2.31	89
21.	2.45 <sup>c</sup>	16.3	1.97	17.8	2.50	119.0	1.81	28	1.85	32	2.22	75
22.	2.46	16.4	1.98 <sup>c</sup>	17.8	2.48	116.0	1.80	28	1.83	30	2.20	72
23.	2.32	16.2	1.99	17.7	2.40	103.0	1.79	27	1.82	29	2.20	72
24.	2.44	16.1	1.95 <sup>c</sup>	17.5	2.31	89.0	1.76	25	1.81	28	2.18	69
25.	2.52	15.9	1.91	17.5	2.29	86.0	1.75	24	1.80	28	3.14	224
26.	2.51	15.8	1.88	17.6	2.10	58.0	1.71	21	1.78	26	3.18	231
27.	2.51	15.7	1.89	18.1	2.09	57.0	1.70	20	1.79	27	2.86	178
28.	2.50	15.8	1.88	18.8	2.09	57.0	1.68	19	1.77	25	2.64	141
29.	2.51	16.0	.....	.....	2.09	57.0	1.65	17	1.78	26	2.40	103
30.	2.56	16.5	.....	.....	2.07	54.0	1.72	22	1.78	26	2.41 <sup>b</sup>	105
31.	2.60	16.8	.....	.....	2.00	46.0	.....	.....	1.78	26	.....	.....

*a* to *a* Ice conditions.*b* to *b* Open water conditions, automatic gauge heights.*c* Estimated gauge height.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Milk River at Peters' Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.58 <sup>ab</sup>	132	2.48	116	2.02	48	2.11	59	2.15	65	2.10	36
2.....	2.46	113	2.36	97	2.48	116	2.11	59	2.15	65	2.04	46
3.....	2.47	114	2.25	80	3.57	297	2.31	89	2.15	65	2.07	51
4.....	2.38	100	2.20	72	2.40	103	2.32	90	2.16	66	2.10	54
5.....	2.35	95	2.18	68	2.20	72	2.29	86	2.16	66	2.11	58
6.....	2.41	105	2.15	64	2.11	59	2.29	86	2.17	67	2.06	56
7.....	2.45	111	2.12	61	2.09	57	2.31	89	2.16	66	1.97	43
8.....	2.37	98	2.11	59	2.09	57	2.33	92	2.15	65	1.99	43
9.....	2.34	93	2.13	62	2.20	72	2.24	78	2.16	66	2.02	40
10.....	2.39	101	2.10	58	2.34	93	2.22	75	2.10 <sup>a</sup>	58	2.00	36
11.....	2.31	89	2.09	57	2.25	80	2.25	80	2.25 <sup>c</sup>	39	2.10	36
12.....	2.30	87	2.09	57	2.30	87	2.30	87	2.12	38	2.03	35
13.....	2.29	86	2.10	58	2.28	84	2.26	81	2.10	37	1.98	35
14.....	2.27	82	2.10	58	2.27	82	2.25	80	2.14	46	2.00	35
15.....	2.21	74	2.10	58	2.16	66	2.30	87	2.15	48	2.00	34
16.....	2.21	74	2.09	57	2.11	59	2.23	76	2.11	58	1.97	33
17.....	2.64	141	2.08	56	2.10	58	2.19	71	2.15	50	1.98	35
18.....	2.94	190	2.08	56	2.10	58	2.16	67	2.14	56	2.12	38
19.....	2.40	103	2.35	95	2.15	65	2.15	65	2.10	58	2.17 <sup>b</sup>	36
20.....	2.29	86	2.55	127	2.20	72	2.15	65	2.15	36	.....	36
21.....	2.22	75	2.28	84	2.16	66	2.15	65	2.13	34	.....	36
22.....	2.19	70	2.20	72	2.13	62	2.15	65	2.11	32	.....	38
23.....	2.20	72	2.16	66	2.13	62	2.15	65	2.10	54	.....	40
24.....	2.36	97	2.14	63	2.24	78	2.14	64	2.11	50	.....	40
25.....	2.29	86	2.12	61	2.18	69	2.14	64	2.09	35	.....	40
26.....	2.40	103	2.11	59	2.17	67	2.14	64	2.17	46	.....	40
27.....	2.38	100	2.10	58	2.15	65	2.15	65	2.12	46	.....	40
28.....	2.57	130	2.09	57	2.15	65	2.15	65	2.28	46	.....	39
29.....	2.65	143	2.08	56	2.17	67	2.15	65	2.25	42	.....	38
30.....	2.50	119	2.06	53	2.15	65	2.16	66	2.13	39	.....	36
31.....	2.32	90	2.03	50	.....	.....	2.15	65	.....	.....	.....	35 <sup>c</sup>

a to a Open water conditions.

b to b Automatic gauge records.

c to c Ice conditions.

## MONTHLY DISCHARGE of North Branch of Milk River at Peters' Ranch, for 1915.

(Drainage area 101 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	16.8	14.9	15.8	0.156	0.18	973
February.....	18.8	16.4	17.2	0.170	0.18	955
March.....	178.0	19.1	65.0	0.644	0.74	3,997
April.....	190.0	17.0	41.0	0.406	0.45	2,440
May.....	87.0	22.0	37.0	0.366	0.42	2,375
June.....	231.0	26.0	120.0	1.190	1.33	7,140
July.....	190.0	70.0	102.0	1.010	1.15	6,372
August.....	127.0	50.0	68.0	0.673	0.78	4,181
September.....	297.0	48.0	78.0	0.772	0.86	4,641
October.....	92.0	59.0	73.0	0.732	0.83	4,489
November.....	67.0	32.0	51.0	0.505	0.56	3,055
December.....	58.0	33.0	40.0	0.396	0.46	2,460
The year.....	.....	.....	.....	.....	7.94	42,857

## NORTH BRANCH OF MILK RIVER NEAR MACKIE'S RANCH.

*Location.*—SW.  $\frac{1}{4}$  Sec. 19, Tp. 2, Rge. 18, W. 4th Mer., about four miles north of the Mackie ranch buildings.

*Records available.*—July 8, 1909, to November 14, 1910. Discharge measurements only were taken during 1911–1915.

*Gauge.*—Vertical staff. Zero maintained at elevation, 91.50 feet, since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Sand, gravel and rock; control probably permanent.

*Discharge measurements.*—During low water by wading, and high water from a cable car.

## DISCHARGE MEASUREMENTS of North Branch of Milk River near Mackie's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 7.....	W. H. Storey.....	64	87.0	1.17	2.18	102
April 28.....	do.....	23	16.2	2.10	1.74	34
May 25.....	G. H. Whyte and W. H. Storey	25	20.4	2.26	1.88	46
June 21.....	W. H. Storey.....	65	90.0	1.49	2.44	134
July 18.....	do.....	66	98.2	1.54	2.52	151
Aug. 4.....	do.....	65	85.5	1.25	2.33	110
Aug. 24.....	do.....	64	71.1	1.02	2.11	72
Sept. 9.....	do.....	65	77.0	1.12	2.17	86
Sept. 29.....	do.....	65	77.5	1.12	2.18	87
Oct. 17.....	do.....	65	84.5	1.15	2.25	97

## SOUTH BRANCH OF MILK RIVER AT CROFF'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 29, Tp. 37 N, Rge. 9, West Prin. Meridian, Montana, U.S.A.

*Records available.*—April 13, 1913, December 31, 1915.

*Gauge.*—Stevens continuous automatic. Elevation of zero maintained at 87.08 feet since establishment.

*Bench-mark.*—Iron pipe. Assumed elevation, 100.00 feet.

*Channel.*—Gravel.

*Discharge measurements.*—During high stages by means of cable and car; during ordinary stages by wading.

*Remarks.*—This station is maintained in conjunction with the United States Geological Survey.

## SESSIONAL PAPER No. 25c

DISCHARGE MEASUREMENTS of South Branch of Milk River at Croff's Ranch, Montana, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Feb. 9	J. E. Degnan	20	11.8	1.44	2.47	17.0a
Feb. 20	W. A. Lamb (U.S.G.S.)	19	12.4	1.60	2.50	19.9a
Mar. 17	J. E. Degnan	73	82.0	2.85	3.72	236.0
Mar. 27	do	38	20.0	1.64	2.68	23.0
April 22	V. A. Newhall	47	32.0	1.89	2.91	60.0
April 25	W. A. Lamb (U.S.G.S.)	42	25.0	2.12	2.80	53.0
May 7	V. A. Newhall	56	47.0	2.04	3.12	96.0
May 27	W. A. Lamb (U.S.G.S.)	44	30.0	2.27	2.92	65.0
June 17	V. A. Newhall	75	76.0	2.37	3.50	181.0
July 1	B. E. Jones (U.S.G.S.)	49	51.0	1.12	2.96	57.0
July 14	do	34	45.0	1.31	2.99	59.0
July 14	V. A. Newhall	76	48.0	1.38	3.00	66.0
Aug. 3	do	59	36.0	1.72	3.05	61.0
Aug. 8	J. C. Hoyt and W. A. Lamb (U.S.G.S.)	52	46.0	0.93	2.59	43.0
Aug. 15	V. A. Newhall	56	30.0	1.51	2.90	47.0
Aug. 31	do	52	22.0	1.27	2.76	29.0
Sept. 15	W. A. Lamb (U.S.G.S.)	75	62.0	1.87	3.36	116.0
Oct. 8	V. A. Newhall	74	62.0	1.67	3.31	104.0
Nov. 11	W. H. Storey	76	43.0	1.48	3.09	64.0a
Nov. 27	W. A. Lamb (U.S.G.S.)	46	41.0	1.27	2.91	52.0a
Dec. 7	W. H. Storey	56	32.0	1.90	2.93	59.0a

a Ice conditions.

## DAILY GAUGE HEIGHT AND DISCHARGE of South Branch of Milk River at Croff's Ranch, Montana, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	2.40	9	2.45	12.0	2.50	20	3.07	96	3.34	147	.....	55a
2	.....	9a	.....	12.0a	2.49	19	3.81	258	3.71	142	.....	100a
3	.....	14a	.....	12.0a	2.49	19	4.07	335	3.65	216	4.65	54.4
4	2.47	14	.....	12.0a	2.49	19	3.40	159	3.34	117	5.39	80.4
5	2.48	15	.....	13.0a	2.48	19	3.16	112	3.25	130	5.45	82.0
6	2.48	15	.....	13.0a	2.41	15	3.09	99	3.25	130	4.17	36.8
7	.....	15a	.....	13.0a	2.43	16	3.02	87	3.14	109	3.77	24.7
8	.....	15a	2.39	13.0	2.44	16	3.05	92	3.05	92	4.70	22.9
9	.....	14a	2.44	16.0	2.47	18	2.93	71	2.99	81	3.70	22.9
10	.....	14a	2.37	12.0	2.44	16	2.89	64	2.95	74	.....	30.0a
11	2.47	14	2.39	13.0	2.38	13	2.88	63	2.90	66	.....	20.0a
12	2.48	15	2.36	12.0	2.40	14	2.90	66	2.90	66	.....	17.5a
13	.....	15a	2.34	10.4	2.40	14	2.91	68	2.95	74	.....	15.0a
14	.....	14a	2.34	10.4	2.42	15	2.95	74	3.53	188	3.28	135
15	.....	14a	2.36	12.0	2.46	18	2.93	71	3.83	263	3.46	172
16	.....	13a	2.38	13.0	2.94	73	2.92	69	3.70	229	3.54	190
17	.....	13a	2.42	15.0	3.48	177	2.82	53	3.63	212	3.46	172
18	.....	12a	2.44	16.0	3.73	237	.....	53a	3.44	168	3.51	183
19	.....	12a	2.44	16.0	3.63	212	.....	53a	3.47	174	3.69	226
20	.....	12a	2.50	20.0	3.50	181	.....	60a	3.35	149	3.51	183
21	.....	11a	2.50	20.0	3.54	190	.....	63a	3.23	126	3.55	147
22	.....	11a	2.50	20.0	3.61	206	2.88	63	3.14	109	3.28	133
23	.....	10a	2.50	20.0	.....	172a	2.84	56	3.08	97	3.29	133
24	.....	10a	2.50	20.0	.....	138a	2.81	52	3.03	88	3.24	122
25	.....	9a	2.50	20.0	.....	103a	2.80	50	3.04	90	3.83	255
26	2.40	9	2.50	20.0	.....	60a	2.80	50	3.02	87	4.94	624
27	.....	9a	2.50	20.0	2.68	34	2.80	50	2.93	71	4.00	316
28	.....	10a	2.50	20.0	2.91	68	2.78	47	2.91	68	4.09	323
29	.....	10a	.....	.....	2.84	56	2.75	43	2.92	69	3.84	247
30	.....	11a	.....	.....	2.81	52	2.81	52	2.91	68	.....	140a
31	.....	12a	.....	.....	2.86	60	.....	.....	.....	55a	.....	.....

a No gauge heights available; discharges given are estimates based on records at Mackie's and Peters' Ranches

DAILY GAUGE HEIGHT AND DISCHARGE of South Branch of Milk River at Croff's Ranch, Montana, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....		160a		160a	2.75	29	3.04	67	2.99	60	2.90	52
2.....		150a		120a	2.93	51	3.05	68		62a	2.90	52
3.....		200a		100a	4.29	367	3.18	88	3.02	64	2.90	52
4.....		170a		80a	4.35	388	3.24	97	3.03	66		57a
5.....		140a	3.02	64	3.48	140	3.25	99		66a		62a
6.....		160a	2.98	58	3.28	104	3.22	94	3.04	67	3.00	67
7.....		140a	2.92	50	3.12	79	3.28	104	2.93	51	2.90	52
8.....		110a	2.90	47	3.06	70	3.26	101	2.84	39	2.95	60
9.....		90a	2.91	48	3.11	78	3.24	97	2.86	42	2.95	60
10.....		85a	2.92	50	3.64	177	3.26	101	2.92	50	2.90	52
11.....		75a	2.99	60	3.56	158	3.20	91	2.97	64	2.90	52
12.....		65a	2.87	43	3.64	177	3.23	96	3.18	63	2.90	52
13.....	2.96	55	2.90	47	3.52	149	3.20	91		62a	2.90	52
14.....	2.98	58	2.94	53	3.50	144	3.19	90		61a	2.90	52
15.....	3.00	61	2.97	57	3.38	121	3.27	102		60a	2.90	52
16.....	3.00	61	2.96	55	3.32	110	3.24	97		60a	2.80	39
17.....	3.08	73	2.98	58	3.22	94	3.18	88		59a	2.80	39
18.....	4.21	339	2.90	47	3.18	88	3.13	80		58a	2.70	28
19.....	3.82	223	2.92	50	3.19	90	3.06	70		57a	2.70	28
20.....	3.66	182	2.98	58	3.24	97	3.00	61		56a	2.75	34
21.....	3.66	182	3.08	73	3.20	91	3.06	70		55a	2.70	28
22.....	3.66	182	3.26	101	3.14	82	3.06	70		55a	2.75	34
23.....	3.67	184	3.09	74	3.10	76	3.02	64		54a	2.75	34
24.....	3.69	190	3.01	62	3.15	84	3.02	64		53a	2.75	34
25.....	3.71	195	2.99	60	3.22	94	3.00	61		52a	2.80	39
26.....	3.75	205	2.96	55	3.14	82	3.00	61		52a	2.75	34
27.....	3.78	213	2.96	55	3.15	84	2.99	60	2.90	52	2.75	34
28.....		235a	2.94	53	3.16	85	3.06	70	2.90	52	2.70	28
29.....		235a	2.90	47	3.16	85	3.04	67	3.00	52	2.70	28
30.....		175a	2.80	34	3.12	79	3.00	61	2.90	52		28a
31.....		125a	2.76	30			3.00	61				28a

a No gauge heights available; discharges given are estimates based on records at Mackie's and Peters' Ranches.

## MONTHLY DISCHARGE of South Branch of Milk River at Croff's Ranch, Montana, for 1915.

(Drainage area 288 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	15	9.0	12.3	0.043	0.05	756
February.....	20	10.4	15.2	0.053	0.06	844
March.....	237	13.0	73.5	0.255	0.29	4,520
April.....	335	43.0	84.4	0.293	0.33	5,020
May.....	263	55.0	125.0	0.434	0.50	7,690
June.....	826	50.0	264.0	0.917	1.02	15,700
July.....	339	55.0	152.0	0.528	0.61	9,350
August.....	160	30.0	62.9	0.218	0.25	3,870
September.....	388	29.0	118.0	0.410	0.46	7,020
October.....	104	60.0	80.4	0.279	0.32	4,940
November.....	67	39.0	56.5	0.196	0.22	3,360
December.....	67	28.0	43.3	0.150	0.17	2,660
The year.....					4.28	65,730

## SOUTH BRANCH OF MILK RIVER AT MACKIE'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 31, Tp. 1, Rge. 18, W. 4th Mer.*Records available.*—July 14, 1909, to October 31, 1915.*Gauge.*—Vertical staff. Maintained at elevation of 86.60 feet since establishment.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Channel.*—Permanent.



## SESSIONAL PAPER No. 25c

*Discharge measurements.*—Made by wading 100 feet below the gauge, or from a cable and car at the gauge during high stages. The initial point for sounding is the face of a cedar post located on left bank.

*Floods.*—Highest water of recent years was in June, 1908.

*Winter flow.*—Station not maintained during the winter.

*Observer.*—Mrs. Nelson.

## DISCHARGE MEASUREMENTS of South Branch of Milk River at Mackie's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 6.....	W. H. Storey.....	85.0	115.0	1.36	2.88	156
April 27.....	do.....	54.0	65.8	0.83	2.37	54
May 25.....	G. H. Whyte and W. H. Storey.....	64.0	82.2	1.15	2.65	95
June 21.....	W. H. Storey.....	84.0	111.8	1.41	2.93	157
July 18.....	do.....	64.0	75.8	1.03	2.56	78
Aug. 4.....	do.....	82.5	90.4	1.24	2.70	112
Aug. 23.....	do.....	73.0	81.0	0.93	2.58	76
Sept. 9.....	do.....	72.0	75.6	0.91	2.52	69
Sept. 29.....	do.....	81.0	92.6	0.91	2.61	84
Oct. 18.....	do.....	82.0	103.2	0.95	2.69	98

## DAILY GAUGE HEIGHT AND DISCHARGE of South Branch of Milk River at Mackie's Ranch, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.44	60	2.29	42	2.38	53
2.....	2.51	70	3.26	252	2.41	56
3.....	2.70	103	3.12	212	2.44	60
4.....	2.79	124	3.13	214	4.44	662
5.....	2.39	54	2.80	126	4.28	603
6.....	2.42	58	2.75	115	4.00	499
7.....	2.56a	78	2.73	110	3.46	313
8.....	2.70	103	2.71	105	3.15	220
9.....	2.69	101	2.62	88	3.06	195
10.....	2.67	97	2.59	82	3.05	192
11.....	2.55	76	2.51	70	3.23	244
12.....	2.51	70	2.49	67	3.04	189
13.....	2.53	73	2.61	86	2.90	151
14.....	2.53	73	2.62	88	2.88	146
15.....	2.59	82	3.31	267	2.97	170
16.....	2.61	86	3.38	288	3.05	192
17.....	2.59	82	3.19	232	3.20	235
18.....	2.56	78	3.17	226	3.04	189
19.....	2.55	76	3.03	186	3.01	181
20.....	2.51	70	2.99	175	2.97	170
21.....	2.51	70	2.88	146	2.93	159
22.....	2.49	67	2.82	131	2.90	151
23.....	2.48	65	2.73	110	2.79	124
24.....	2.46	63	2.71	105	2.85	138
25.....	2.42	58	2.65	94	2.79	124
26.....	2.40	55	2.60	84	4.07	858
27.....	2.37	51	2.58	81	3.88	455
28.....	2.36	50	2.53	73	3.70	390
29.....	2.33	47	2.48	65	3.10	206
30.....	2.27	40	2.41	56	2.90	151
31.....			2.43	59		

a Gauge height interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of South Branch of Milk River at Mackie's Ranch,  
for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.80	126	2.76	117	2.17	31	2.59	82
2.....	2.97	170	2.96	167	2.35	49	2.54	74
3.....	2.95	165	2.82	131	2.98	173	2.55	76
4.....	3.15	220	2.70	103	3.90	462	2.65	94
5.....	2.97	170	2.58	81	3.72	397	2.74	112
6.....	2.84	136	2.46	63	2.89	145	2.72	108
7.....	3.05	192	2.38	53	2.67	97	2.70	103
8.....	2.80	126	2.34	48	2.64	92	2.77	119
9.....	2.65	94	2.29	42	2.52	71	2.77	119
10.....	2.61	86	2.25	38	2.63	90	2.80	126
11.....	2.63	90	2.45	61	3.10	206	2.69	101
12.....	2.59	82	2.37	51	2.95	165	2.77	119
13.....	2.50	68	2.33	47	3.01	181	2.76	117
14.....	2.49	67	2.29	42	2.98	173	2.74	112
15.....	2.50	68	2.28	41	2.90	151	2.69	101
16.....	2.54	74	2.34	48	2.82	131	2.69	101
17.....	2.52	71	2.34	48	2.79	124	2.72	108
18.....	2.56	78	2.32	45	2.67	97	2.69	101
19.....	3.66	377	2.33	47	2.62	88	2.62	88
20.....	2.95	165	2.45	61	2.64	92	2.56	78
21.....	2.76	117	2.42	58	2.66	95	2.56	78
22.....	2.62	88	2.35	49	2.65	94	2.56	78
23.....	2.58	81	2.58	81	2.59	82	2.56	78
24.....	2.55	76	2.53	73	2.59	82	2.56	78
25.....	2.46	63	2.48	65	2.58	81	2.56	78
26.....	2.66	95	2.35	49	2.67	97	2.56	78
27.....	3.20	235	2.32	45	2.65	94	2.56	78
28.....	3.29	261	2.35	38	2.58	81	2.55	76
29.....	3.27	255	2.24	37	2.60	84	2.55	76
30.....	3.22	241	2.20	33	2.61	86	2.54	74
31.....	2.95	165	2.18	31	.....	.....	2.54	74

MONTHLY DISCHARGE of South Branch of Milk River at Mackie's Ranch, for 1915.

(Drainage area 504 square miles.)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	124	40	73	0.145	0.16	4,344
May.....	288	42	130	0.258	0.30	7,993
June.....	858	53	249	0.494	0.55	14,817
July.....	377	63	139	0.276	0.32	8,547
August.....	167	31	61	0.121	0.14	3,751
September.....	462	31	130	0.258	0.29	7,736
October.....	126	74	93	0.185	0.21	5,718
The period.....	.....	.....	.....	.....	1.97	52,906

MILK RIVER AT MILK RIVER.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 16, W. 4th Mer.

*Records available.*—July 1, 1909, to December 31, 1915.

*Gauge.*—Vertical staff, maintained at the original elevation of 3,403.39 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Elevation 3,412.42 feet above mean sea level. (Geodetic Survey of Canada.)

*Channel.*—The stream flows in one channel at all stages; bed consists of sand and fine gravel, and shifts during flood conditions.

*Discharge measurements.*—At low stages made by wading; at high stages from the traffic bridge 100 feet above the gauge.

*Observer.*—Dan. O'Connell.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Milk River at Milk River, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 11	O. H. Hoover	93.0	59.3	0.48	2.25	29
Jan. 25	J. E. Degnan	49.0	34.6	0.64	2.33	22
Feb. 11	do	48.5	37.0	0.66	2.80	24
Mar. 2	do	52.0	42.5	0.71	3.07	30
Mar. 10	do	59.0	41.3	1.01	2.89	45
Mar. 15	W. H. Storey	57.0	39.1	1.18	3.02	44
April 5	do	108.0	194.0	2.27	2.51	250
April 6	do	107.0	145.0	1.72	2.04	90
April 7	do	61.0	71.7	1.25	1.47	71
April 29	do	59.5	57.3	1.24	1.28	132
May 26	G. H. Whyte and W. H. Storey	63.5	92.0	1.44	1.62	324
June 18	W. H. Storey	116.0	179.6	1.80	2.31	519
June 28	J. E. Degnan	117.4	265.0	1.96	2.80	187
July 17	W. H. Storey	116.3	130.3	1.43	1.78	677
July 19	do	118.3	295.0	2.23	3.13	276
Aug. 3	do	117.3	149.4	1.85	2.10	189
Aug. 5	do	117.3	119.6	1.58	1.85	147
Aug. 24	do	116.3	106.7	1.38	1.68	351
Sept. 6	do	117.3	189.6	2.01	2.42	224
Sept. 7	do	117.0	139.0	1.61	1.98	272
Sept. 13	do	116.3	153.0	1.77	2.10	164
Sept. 28	do	117.3	105.6	1.55	1.76	210
Oct. 16	do	116.8	135.5	1.55	1.94	199
Oct. 18	do	116.3	124.9	1.59	1.87	152
Nov. 3	do	118.3	111.5	1.36	1.77	104
Nov. 20	do	117.8	102.2	1.01	2.18	61
Dec. 14	do	116.3	77.6	0.78	2.00	

## DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Milk River, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.09	29	2.58	21	3.15	31	1.65	138	1.35	77	1.35	77
2	2.13	29	2.59	22	3.06	31	2.20	304	1.48	100	1.35	77
3	2.15	30	2.61	22	3.04	31	2.43	386	2.20	304	1.55	115
4	2.14	30	2.66	24	3.05	32	3.15	684	2.10	270	2.40	375
5	2.15	30	2.77	25	3.04	32	2.55	432	1.95	222	4.05	1,080
6	2.09	29	2.77	26	2.95	34	2.25	322	1.77	167	3.90	1,014
7	2.18	29	2.81	26	2.94	36	2.11	273	1.80	177	3.15	684
8	2.20	28	2.81	26	2.95	38	1.90	206	1.70	150	2.50	412
9	2.21	28	2.84	26	2.95	41	1.81	180	1.58	122	2.29	336
10	2.25	28	2.84	25	2.91	42	1.75	164	1.52	108	2.15	287
11	2.23	29	2.82	25	2.91	43	1.70	150	1.45	95	2.90	575
12	2.28	29	2.80	25	2.89	44	1.60	126	1.43	91	2.35	357
13	2.30	31	2.80	27	2.93	45	1.50	104	1.48	100	2.20	304
14	2.30	31	2.80	27	2.97	46	1.60	126	1.55	115	2.10	270
15	2.35	30	2.95	28	3.02	47	1.60	126	1.94	218	2.15	287
16	2.28	30	2.89	29	3.04	50	1.60	126	2.54	428	2.31	343
17	2.28	29	2.98	29	3.07	74	1.60	126	2.38	368	2.35	357
18	2.20	27	2.80	29	5.22	260a	1.55	115	2.50	412	2.28	332
19	2.20	25	2.90	28	6.07	600	1.54	113	2.14	284	2.60	451
20	2.10	22	2.95	28	5.01	900	1.53	111	2.12	277	2.57	439
21	2.30	21	2.95	28	5.02	900	1.56	117	1.96	225	2.24	318
22	2.35	22	3.00	28	6.61	1,200	1.55	115	1.86	194	2.00	237
23	2.38	22	3.00	30	4.53	1,050	1.94	113	1.73	158	1.90	266
24	2.34	22	3.05	30	3.42	800	1.53	111	1.72	155	1.87	197
25	2.33	22	3.05	31	2.38	300	1.45	95	1.66	140	2.00	237
26	2.36	22	3.05	31	2.06	230a	1.46	96	1.62	131	4.40	1,234
27	2.39	22	3.05	31	1.99	234	1.32	72	1.60	126	3.65	904
28	2.40	21	3.07	31	1.62	131	1.30	69	1.52	108	2.95	590
29	2.44	21			1.89	203	1.25	62	1.44	93	2.75	612
30	2.44	21			1.79	174	1.28	66	1.41	87	2.30	339
31	2.54	21			1.74	161			1.35	77		

a to a Ice breaking up. Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Milk River, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.10	270	2.12	277	1.40	85	1.77	169	1.75	163	2.08	85
2.....	2.20	304	2.30	339	1.54	113	1.73	158	1.77	169	2.15	84
3.....	2.30	339	2.10	270	1.95	222	1.80	177	1.79	174	2.15	82
4.....	2.18	297	2.00	237	3.75	948	1.90	206	1.80	177	2.18	81
5.....	2.34	353	1.85	191	2.70	492	2.00	237	1.80	177	2.23	80
6.....	2.10	270	1.75	163	2.10	270	1.98	231	1.80	177	2.25	79
7.....	2.05	253	1.66	140	1.88	200	1.95	222	1.80	177	2.25	78
8.....	2.05	253	1.62	131	1.75	164	1.95	222	1.80	177	2.25	77
9.....	1.95	222	1.60	126	1.73	158	2.00	237	1.60	126	2.20	76
10.....	1.85	191	1.56	117	1.70	150	2.02	244	1.65	138	2.25	73
11.....	1.84	189	1.55	115	1.90	206	1.90	206	1.75 <sup>c</sup>	131	2.23	71
12.....	1.80	177	1.65	138	2.13	280	1.93	215	1.75	124	2.08	68
13.....	1.74	161	1.59	124	2.12	277	1.95	222	1.78	117	2.05	64
14.....	1.71	153	1.54	113	2.05	253	1.95	222	1.90	140	2.01	61
15.....	1.70	150	1.55	115	2.05	253	1.90	206	1.89	106	2.06	59
16.....	1.70	150	1.54	113	1.97	228	1.94	218	1.95	102	2.11	59
17.....	1.77	169	1.57	119	1.90	206	1.95	222	1.85	100	2.11	59
18.....	1.84	189	1.54	113	1.84	189	1.85	191	2.01 <sup>c</sup>	100	2.11	59
19.....	3.12	671	1.55	115 <sup>b</sup>	1.80	177	1.83	186	2.11 <sup>d</sup>	102	2.08	58
20.....	2.39	371	1.90	206	1.76	166	1.80	177	2.18	104	2.09	57
21.....	2.03	247	1.95	222	1.80	177	1.77	169	2.10	103	2.06	56
22.....	1.84	187	1.70	150	1.80	177	1.80	177	2.05	100	2.11	55
23.....	1.75	164	1.70	150	1.75	164	1.78	172	2.12	97	2.13	53
24.....	1.74	161	1.67	143	1.74	161	1.73	158	2.10	95	2.11	52
25.....	1.75	164	1.70	150	1.77	169	1.77	169	2.05	92	2.16	50
26.....	1.85	191	1.55	115	1.80	177	1.70	150	1.95	89	2.14	48
27.....	1.85	191	1.51	106	1.80	177	1.70	150	1.92	86	2.16	47
28.....	2.32	346	1.46	96	1.75	164	1.73	158	1.80	81	2.19	45
29.....	2.48	404	1.45	95	1.77	169	1.75	164	1.95	83	2.19	44
30.....	2.88	567	1.43	91	1.78	172	1.75	164	2.08	85	2.24	42
31.....	2.45	393	1.41	87	.....	.....	1.75	164	.....	.....	2.11	40

<sup>b</sup> Interpolated.<sup>c</sup> Channel closing. Discharge estimated.<sup>d</sup> Ice conditions.

## MONTHLY DISCHARGE of Milk River at Milk River, for 1915.

(Drainage area 1,104 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	31	21	26	0.024	0.03	1,599
February.....	31	21	27	0.024	0.03	1,500
March.....	1,200	31	253	0.229	0.26	15,556
April.....	684	62	174	0.158	0.18	10,354
May.....	428	77	180	0.163	0.19	11,068
June.....	1,234	77	432	0.391	0.44	25,706
July.....	671	150	263	0.238	0.27	16,171
August.....	339	87	151	0.137	0.16	9,285
September.....	948	85	225	0.204	0.23	13,888
October.....	244	150	192	0.174	0.20	11,806
November.....	177	81	122	0.111	0.12	7,260
December.....	85	40	63	0.057	0.07	3,874
The year.....	.....	.....	.....	.....	2.18	127,567

## SESSIONAL PAPER No. 25c

## MILK RIVER AT WRITING-ON-STONE POLICE DETACHMENT.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 35, Tp. 1, Rge. 13, W. 4th Mer.

*Records available.*—August 2, 1909, to October 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation, 86.13 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation 100.00 feet.

*Channel.*—Composed of sand and shifts in changes of stage.

*Discharge measurements.*—Made from a cable and ear during high water and at low stages by wading.

*Observer.*—A. P. White and W. Adams.

## DISCHARGE MEASUREMENTS of Milk River at Writing-on-Stone Police Detachment, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 18.....	W. H. Storey.....	135.0	125.5	0.92	3.00	116
Mar. 30.....	do.....	126.0	136.0	2.03	2.59	276
April 11.....	do.....	59.0	99.7	1.92	2.30	192
April 23.....	do.....	73.0	73.7	1.54	1.98	114
May 2.....	do.....	73.0	66.6	1.35	1.80	90
May 20.....	do.....	112.0	163.8	1.80	2.65	294
May 29.....	G. H. Whyte and W. H. Storey	72.5	71.8	1.61	1.97	116
June 15.....	W. H. Storey.....	111.0	139.1	2.02	2.69	280
June 23.....	do.....	86.0	111.2	2.02	2.55	225
July 13.....	do.....	86.0	104.6	1.77	2.38	185
July 21.....	do.....	108.5	160.4	2.06	2.87	331
July 31.....	do.....	130.0	231.5	2.28	3.38	528
Aug. 7.....	do.....	74.0	91.2	1.68	2.24	154
Aug. 18.....	do.....	73.0	80.6	1.49	2.05	120
Aug. 25.....	do.....	74.0	92.4	1.58	2.20	146
Sept. 4.....	do.....	84.0	109.2	1.83	2.51	199
Sept. 5.....	do.....	132.0	355.0	2.34	4.09	833
Sept. 15.....	do.....	101.0	126.1	1.92	2.62	242
Sept. 24.....	do.....	92.0	105.7	1.58	2.28	167
Oct. 2.....	do.....	91.0	103.2	1.59	2.25	164
Oct. 4.....	do.....	91.0	102.8	1.60	2.26	164
Oct. 13.....	do.....	89.0	114.6	1.62	2.43	186
Oct. 19.....	do.....	89.0	112.8	1.61	2.36	181
Oct. 30.....	do.....	85.0	92.3	1.53	2.19	142

DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Writing-on-Stone Police Detachment,  
for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			2.45	233	1.74	83	1.89	100
2.			2.46	236	1.80	90	1.90	102
3.			3.05	417	2.16	157	2.00	118
4.			3.30	501	2.79	335	2.90	360
5.			3.70	664	2.80	338	4.20	862
6.			3.05	417	2.83	347	4.80	1,120
7.			2.70	308	2.74	320	4.75	1,094
8.			2.58	272	2.26	181	4.53	999
9.			2.49	245	2.25	178	3.80	681
10.			2.70	308	2.20	166	2.90	350
11.			2.69	305	2.10	143	2.77	311
12.			2.22	171	1.85	98	3.30	477
13.			2.20	166	1.84	96	2.78	311
14.			2.14	152	1.91	107	2.80	314
15.			2.16	157	1.96	116	3.02	382
16.			2.12	148	2.46	236	2.73	290
17.			2.13	150	3.12	440	2.81	314
18.			2.12	148	3.03	411	2.84	320
19.	4.45	400a	2.11	145	2.98	395	2.90	335
20.	5.25	1,000	2.09	141	2.65	293	3.16	417
21.	3.43	500	2.11	145	2.62	284	3.10	395
22.	3.85	650	2.02	127	2.50	248	2.87	320
23.	5.20	1,100a	2.00	123	2.22	171	2.60	237
24.	4.50	1,008	2.03	129	2.20	166	2.61	240
25.	3.80	707	1.97	118	2.17	159	2.60	237
26.	3.00	401	1.98	119	2.14	152	2.63	246
27.	2.65	293	1.82	93	2.10	143	4.74	1,111
28.	2.50	248	1.81	92	2.07	137	3.80	707
29.	2.45	233	1.80	90	1.97	118	3.84	724
30.	2.54	260	1.75	84	1.88	100	3.40	539
31.	2.50	248			1.92	107		

a to a Estimated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Writing-on-Stone Police Detachment for 1915.—*Concluded.*

DAY.	July.		August.		September		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3.20	459	3.05	399	2.14	135	2.26	156
2	2.83	313	2.63	246	2.27	158	2.25	155
3	2.84	317	2.95	360	2.36	177	2.33	170
4	2.83	313	2.63	246	2.53	218	2.26	156
5	2.84	317	2.44	195	4.17	866	2.29	162
6	2.76	288	2.43	193	3.30	499	2.22	168
7	2.74	282	2.27	158	2.70	268	2.39	187
8	2.73	278	2.20	145	2.53	218	2.45	197
9	2.80	302	2.09	126	2.39	183	2.42	190
10	2.79	299	2.07	123	2.41	187	2.45	197
11	2.49	207	2.06	122	2.30	164	2.54	221
12	2.45	197	2.05	121	2.90	340	2.56	210
13	2.37	179	2.22	149	2.70	268	2.51	201
14	2.35	174	2.10	128	2.73	278	2.49	208
15	2.33	170	2.08	125	2.65	253	2.47	200
16	2.33	170	2.09	126	2.59	234	2.45	187
17	2.33	170	2.06	122	2.54	221	2.47	190
18	2.34	172	2.06	122	2.41	187	2.40	185
19	2.35	174	2.05	121	2.37	179	2.37	179
20	3.38	531	2.06	122	2.30	164	2.32	188
21	2.91	344	2.08	125	2.25	155	2.30	184
22	2.54	221	2.66	256	2.30	164	2.25	173
23	2.49	207	2.21	147	2.32	168	2.34	179
24	2.42	190	2.20	145	2.29	162	2.28	171
25	2.52	215	2.20	145	2.26	156	2.25	165
26	2.40	185	2.14	135	2.26	156	2.22	166
27	2.36	177	2.10	128	2.34	172	2.21	147
28	2.44	195	2.09	127	2.30	164	2.21	147
29	3.41	543	2.08	125	2.28	160	2.19	140
30	3.20	459	2.09	127	2.25	155	2.20	143
31	3.26	483	2.10	128			2.22	151

## MONTHLY DISCHARGE of Milk River at Writing-on-Stone Police Detachment, for 1915

(Drainage area 1,546 square miles.)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area	Total in Acres feet
March (10-31)	1,100	233	542	0.351	0.17	10,876
April	664	84	213	0.138	0.15	12,874
May	440	83	204	0.132	0.15	12,544
June	1,120	190	467	0.302	0.34	27,788
July	543	170	275	0.178	0.21	16,900
August	399	121	162	0.103	0.12	14,487
September	866	135	227	0.147	0.16	14,487
October	221	143	173	0.112	0.13	10,657
The period					1.45	147,984



## DEER CREEK AT DICKINSON'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 15, Tp. 1, Rge. 12, W. 4th Mer.

*Records available.*—May 26, 1911, to November 7, 1911, May 3, 1915, to October 31, 1915.

Discharge measurements only in 1912-14.

*Gauge.*—Vertical staff. Zero elevation, maintained at 90.72 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—One channel at all stages.

*Discharge measurements.*—At low stages made by wading; at high stages can be made from traffic bridge 200 feet above gauge.

*Observer.*—H. E. Sammons.

## DISCHARGE MEASUREMENTS of Deer Creek at Dickinson's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 3.....	W. H. Storey.....	7.0	2.09	0.49	1.68	1.03
May 20.....	do.....	16.0	5.70	1.47	2.00	8.35
June 15.....	do.....	17.0	10.20	0.47	1.90	4.80
June 24.....	do.....	12.0	4.40	1.45	1.88	6.40
July 22.....	do.....	8.5	2.55	1.18	1.78	3.02
Aug. 8.....	do.....	9.5	2.38	0.87	1.75	2.06
Aug. 18.....	do.....	5.5	2.48	0.49	1.67	1.21
Aug. 26.....	do.....	5.0	2.10	0.37	1.64	0.77
Sept. 4.....	do.....	5.3	2.46	0.44	1.68	1.09
Sept. 16.....	do.....	5.5	2.59	0.43	1.67	1.11
Sept. 24.....	do.....	5.5	2.23	0.37	1.65	0.83
Oct. 5.....	do.....	6.0	2.60	0.50	1.71	1.37
Oct. 13.....	do.....	6.0	2.60	0.50	1.69	1.31
Oct. 20.....	do.....	6.0	2.60	0.48	1.69	1.25

## DAILY GAUGE HEIGHT AND DISCHARGE of Deer Creek at Dickinson's Ranch, for 1915.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.74	1.82	1.83	4.50	1.85	4.00	1.60	0.52	1.64	0.83	1.74	1.82
2.....	1.74	1.82	1.83	4.50	1.83	3.50	1.79	2.50	1.65	0.91	1.74	1.82
3.....	1.68	1.14	2.60	34.00	1.83	4.50	1.80	3.00	1.77	2.20	1.68	1.14
4.....	1.69	1.22	3.00	51.00	1.81	4.00	1.80	3.00	1.73	1.69	1.68	1.14
5.....	1.68	1.14	2.70	38.00	1.80	3.70	1.78	2.70	1.70	1.30	1.71	1.40
6.....	1.67	1.07	2.50	30.00	1.78	3.40	1.75	2.00	1.68	1.14	1.68	1.14
7.....	1.66	0.99	2.02	9.10	1.78	3.40	1.75	2.00	1.66	0.99	1.66	0.99
8.....	1.63	0.75	2.01	8.70	1.78	3.40	1.75	2.00	1.66	0.99	1.66	0.99
9.....	1.60	0.52	2.00	8.30	1.78	3.40	1.74	1.82	1.70	1.30	1.66	0.99
10.....	1.60	0.52	1.97	7.20	1.77	3.20	1.73	1.69	1.70	1.30	1.71	1.40
11.....	1.60	0.52	1.95	6.50	1.77	3.20	1.70	1.30	1.71	1.40	1.71	1.40
12.....	1.61	0.60	1.95	6.50	1.77	3.20	1.70	1.30	1.71	1.40	1.70	1.30
13.....	1.76	2.10	1.95	6.50	1.79	3.50	1.70	1.30	1.71	1.40	1.70	1.30
14.....	1.76	2.10	1.95	6.50	1.79	3.50	1.68	1.14	1.67	1.07	1.69	1.22
15.....	1.85	3.60	1.95	6.50	1.75	2.80	1.68	1.14	1.67	1.07	1.68	1.14
16.....	1.95	6.50	1.95	6.90	1.75	2.80	1.68	1.14	1.67	1.07	1.68	1.14
17.....	1.95	6.50	1.95	6.90	1.83	4.50	1.68	1.14	1.67	1.07	1.68	1.14
18.....	2.00	8.30	1.95	7.20	1.83	4.50	1.67	1.07	1.67	1.07	1.68	1.14
19.....	2.00	8.30	1.93	6.50	1.81	4.00	1.67	1.07	1.68	1.14	1.68	1.14
20.....	2.00	8.30	1.93	6.90	1.79	3.50	1.68	1.14	1.67	1.07	1.69	1.22
21.....	1.95	6.50	1.93	7.20	1.79	3.50	1.67	1.07	1.66	0.99	1.68	1.14
22.....	1.90	4.70	1.93	7.20	1.78	3.40	1.66	0.99	1.66	0.99	1.68	1.14
23.....	1.85	3.60	1.92	7.20	1.79	3.40	1.65	0.91	1.65	0.91	1.68	1.14
24.....	1.85	3.60	1.92	7.10	1.79	3.40	1.65	0.91	1.65	0.91	1.68	1.14
25.....	1.80	2.60	2.00	10.20	1.77	3.00	1.64	0.83	1.65	0.91	1.67	1.07
26.....	1.80	2.60	1.93	7.50	1.77	2.80	1.64	0.83	1.65	0.91	1.67	1.07
27.....	1.73	1.69	1.90	6.30	1.77	2.80	1.63	0.75	1.65	0.91	1.67	1.07
28.....	1.73	1.69	1.87	5.50	1.76	2.70	1.61	0.60	1.65	0.91	1.67	1.07
29.....	1.74	1.82	1.84	4.70	1.93	6.30	1.61	0.60	1.65	0.91	1.66	0.99
30.....	1.74	1.82	1.84	4.70	1.83	3.70	1.60	0.52	1.65	0.91	1.65	0.91
31.....	1.74	1.82	.....	.....	1.83	3.70	1.60	0.52	.....	.....	1.65	0.91

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Deer Creek at Dickinson's Ranch, for 1915.

(Drainage area 7 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (3-31).....	8.30	0.52	3.00	0.429	0.46	172
June.....	51.00	1.82	10.80	1.543	1.72	643
July.....	6.30	2.70	3.60	0.514	0.59	221
August.....	4.00	0.52	1.48	0.211	0.24	91
September.....	2.50	0.52	1.17	0.167	0.19	70
October.....	1.40	0.83	1.13	0.161	0.19	69
The period.....					3.39	1,266

## DEER CREEK CATTLE COMPANY EAST DITCH FROM DEER CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 36, Tp. 1, Rge. 12, W. 4th Mer.*Records available.*—April 1, 1912, to November 23, 1912, March 31, 1915, to September 11, 1915; discharge measurements only during 1914.*Gauge.*—Vertical staff. Elevation of zero has been maintained at 93.49 feet since establishment.*Bench-mark.*—Permanent iron bench-mark located 250 feet below headgates. Assumed elevation, 100.00 feet.*Discharge measurements.*—Made by wading or with a weir.*Observer.*—F. W. Webster.*Remarks.*—The Deer Creek Cattle Company diverts all the water from Deer Creek through the two ditches, except in flood stages.

## DISCHARGE MEASUREMENTS of Deer Creek Cattle Company East Ditch from Deer Creek, in 1915.

Date.	Engineer	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge.
		Feet	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 19.....	W. H. Storey.....				2.23	1 228a
Mar. 29.....	do.....				2.09	0 441a
April 12.....	do.....				2.13	0 674a
April 22.....	do.....				2.10	1 204a
April 22.....	do.....	4 0	1.50	0.83	2.10	1 240
May 4.....	do.....				1.94	0 609a
May 4.....	do.....	3.4	0.83	0.77	1.94	0 640
May 19.....	do.....				2.42	5 691a
May 19.....	do.....	6.4	3.34	1.75	2.42	5 860
June 15.....	do.....	7 0	3.90	1.36	3.11	5 320
June 15.....	do.....				3.11	5 400a
June 24.....	do.....				3.14	N.B.
July 12.....	do.....	4.8	2.37	1.03	2.19	2 400
July 22.....	do.....	3.7	1.43	0.71	1.97	1 020
July 30.....	do.....	9 0	3.90	1.43	2.40	5 600
Aug. 8.....	do.....	4.4	1.78	0.95	2.11	1 690
Aug. 17.....	do.....	4.0	1.45	0.48	1.96	0 700
Aug. 26.....	do.....	4.0	1.02	0.26	1.77	0 270
Sept. 3.....	do.....	4.3	1.59	0.57	2.11	0 910
Sept. 16.....	do.....	4.5	1.85	0.32	2.30	0 600
Sept. 23.....	do.....	4.5	1.70	0.35	2.11	0 590
Oct. 5.....	do.....	5 0	2.10	0.68	2.31	1 430
Oct. 12.....	do.....	4.8	1.47	0.58	2.33	0 850
Oct. 20.....	do.....	4.8	1.47	0.56	2.32	0 820
Oct. 29.....	do.....	4.5	1.34	0.69	2.27	0 920

a Weir measurements.

DAILY GAUGE HEIGHT AND DISCHARGE of Deer Creek Cattle Company East Ditch from Deer Creek, for 1915.

DAY.	March.		April.		May		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2.37	2.70	1.94	0.65	2.09	1.19
2			2.37	2.70	1.94	0.65	2.49	8.00
3			2.37	2.70	1.94	0.65	3.89	8.00
4			2.36	2.50	1.94	0.65	3.89	8.00
5			2.33	2.20	1.92	0.59	3.89	8.00
6			2.31	1.93	1.91	0.57	3.49	8.00
7			2.31	1.93	1.89	0.52	3.49	8.00
8			2.21	1.08	1.88	0.50		<sup>b</sup>
9			2.21	1.08	1.87	0.48		
10			2.21	1.08	1.86	0.46		
11			2.21	1.08	1.60	0.05		
12			2.15	0.79	1.56	0.03		
13			2.15	0.84	2.10	1.23		
14			2.15	0.89	2.10	1.23		
15			2.15	0.95	2.10	1.23		
16			2.21	1.49	2.10	1.23		
17			2.21	1.57	2.42	5.90		
18			2.21	1.65	2.42	5.90		
19			2.21	1.73	2.42	5.90		
20			2.11	1.00	2.35	4.20		
21			2.11	1.08	2.35	4.20		
22			2.10	1.23	2.35	4.20		
23			2.10	1.23	2.30	3.20		
24			2.10	1.23	2.30	3.20		
25			2.09	1.19	2.26	2.70		
26			2.07	1.10	2.26	2.70		
27			2.04	0.98	2.24	2.40		
28			2.02	0.89	2.22	2.20		
29			1.99	0.78	2.22	2.20		
30			1.98	0.76	2.22	2.20		
31			2.37 <sup>a</sup>	2.7	2.10	1.23		

<sup>a</sup> Headgates opened.

<sup>b</sup> Headgates closed.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Deer Creek Cattle Company East Ditch from Deer Creek, for 1915.—*Concluded.*

DAY.	July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					1.78a	0.26
2					1.97	0.57
3					2.11	0.94
4					2.00	0.81
5					2.00	0.81
6	2.20a	2.50			2.05	1.03
7	2.40	5.60			2.05	1.03
8	2.52	9.20			1.98	0.76
9	2.34	4.50			1.95	0.68
10	2.41	6.00			1.55	0.68
11	2.27	3.40			1.90	0.54
12	2.19	2.40			b	
13	2.49	8.40				
14	2.49	8.40				
15	2.34	4.50				
16	2.34	4.50				
17	b		1.90a	0.54		
18			1.94	0.65		
19			1.91	0.57		
20			1.90	0.54		
21			1.86	0.46		
22			1.86	0.46		
23			1.84	0.41		
24			1.81	0.35		
25			1.81	0.35		
26			1.79	0.31		
27			1.79	0.31		
28			1.78	0.30		
29			b			
30						
31						

a Headgates opened.

b Headgates closed.

## MONTHLY DISCHARGE of Deer Creek Cattle Company East Ditch from Deer Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet
	Maximum.	Minimum.	Mean.	
March (31)				
April	2.70	2.70	2.70	5
May	2.70	0.76	1.40	83
June (1-7)	5.90	0.03	2.00	123
July (6-16)	8.00	1.19	7.00	97
August (17-28)	9.20	2.50	5.40	118
September (1-11)	0.65	0.30	4.30	10
	1.03	0.26	0.74	16
The period				452

## DEER CREEK CATTLE COMPANY WEST DITCH FROM DEER CREEK

*Location.*—On the SW  $\frac{1}{4}$  Sec. 36, Tp. 1, Rge. 12, W. 4th Mer

*Records available.*—May 17, to July 27, 1915; discharge measurements during 1914

*Gauge.*—Vertical staff. Zero maintained at elevation of 100.50 feet since establishment

*Bench-mark.*—Permanent iron bench-mark at East Ditch station, Assumed elevation, 100.00 feet.

*Discharge measurements.*—By wading or with a weir.

*Observer.*—F. W. Webster.

## DISCHARGE MEASUREMENTS of Deer Creek Cattle Company West Ditch from Deer Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft</i>
Mar. 19.....	W. H. Storey .....				Dry.	Nil
Mar. 29.....	do .....				"	"
April 12.....	do .....				"	"
April 22.....	do .....				"	"
May 4.....	do .....				"	"
May 19.....	do .....	3.2	1.45	1.31	3.57	1.91
June 15.....	do .....				Dry.	Nil.
June 24.....	do .....				"	"
July 12.....	do .....				"	"
July 22.....	do .....	2.4	0.94	1.23	3.49	1.16
July 30.....	do .....				Dry.	Nil.
Aug. 8.....	do .....				"	"
Aug. 17.....	do .....				"	"
Aug. 26.....	do .....				"	"
Sept. 3.....	do .....				"	"
Sept. 16.....	do .....				"	"
Sept. 23.....	do .....				"	"
Oct. 5.....	do .....				"	"
Oct. 12.....	do .....				"	"
Oct. 20.....	do .....				"	"
Oct. 29.....	do .....				"	"

## DAILY GAUGE HEIGHT AND DISCHARGE of Deer Creek Cattle Company West Ditch from Deer Creek, for 1915.

DAY.	May.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....				
2.....				
3.....				
4.....				
5.....				
6.....				
7.....				
8.....				
9.....				
10.....				
11.....				
12.....				
13.....				
14.....				
15.....				
16.....				
17.....	3.57 <sup>a</sup>	1.98	3.67 <sup>a</sup>	3.30
18.....	3.57	1.98	3.67	3.30
19.....	3.57	1.98	3.67	3.30
20.....	3.50	1.22	3.62	2.60
21.....	3.50	1.22	3.62	2.60
22.....	3.45	0.96	3.62	2.60
23.....	3.45	0.96	3.62	2.60
24.....	3.45	0.96	3.62	2.60
25.....	b		3.62	2.60
26.....			3.57	1.98
27.....			3.57	1.98
28.....			b	
29.....				
30.....				
31.....				

<sup>a</sup> Headgates opened.<sup>b</sup> Headgates closed.

## SESSIONAL PAPER No. 25c

MONTHLY DISCHARGE of Deer Creek Cattle Company West Ditch from Deer Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet
	Maximum.	Minimum.	Mean.	
May (17-24).....	1.98	0.96	1.41	22
July (17-27).....	3.30	1.98	2.60	57
The period.....				79

## FORNFEIST DITCH NEAR ST. KILDA.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 31, Tp. 1, Rge. 11, W. 4th Mer.*Records available.*—From September 16, 1915, to October 31, 1915.*Gauge.*—Vertical staff. Zero maintained at elevation of 98.45 feet since establishment.*Bench-mark.*—Temporary wooden bench-mark. Assumed elevation, 100.00 feet.*Discharge measurements.*—Made by wading or by weir.*Observer.*—Julius Fornfeist.*Note.*—Station established September 16, 1915, by W. H. Storey.

## DISCHARGE MEASUREMENTS of Fornfeist Ditch near St. Kilda, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
Sept. 16.....	W. H. Storey.....	3.0	0.56	0.36	0.65	0.200
Sept. 23.....	do.....	2.0	0.48	0.21	0.55	0.100
Oct. 6.....	do.....	3.0	0.65	0.35	0.68	0.230
Oct. 12.....	do.....					0.194 <sup>a</sup>
Oct. 21.....	do.....					0.109 <sup>a</sup>
Oct. 29.....	do.....					0.109 <sup>b</sup>

<sup>a</sup> Measurement made with weir.<sup>b</sup> Small trickle only.

## DAILY GAUGE HEIGHT AND DISCHARGE of Fornfeist Ditch near St. Kilda, for 1915.

DAY.	September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			0.54	0.10
2.			0.54	0.10
3.			0.61	0.16
4.			0.61	0.16
5.			0.61	0.16
6.			0.68	0.23
7.			0.68	0.23
8.			0.65	0.20
9.			0.65	0.20
10.			0.65	0.20
11.			0.68	0.23
12.			0.65	0.20
13.			0.65	0.20
14.			0.65	0.20
15.			0.65	0.20
16.	0.65	0.20	0.60	0.15
17.	0.60	0.15	0.60	0.15
18.	0.60	0.15	0.60	0.15
19.	0.59	0.14	0.60	0.15
20.	0.55	0.11	0.55	0.11
21.	0.55	0.11	0.55	0.11
22.	0.53	0.10	0.55	0.11
23.	0.52	0.09	0.50	0.07
24.	0.55	0.11	0.50	0.07
25.	0.55	0.11	0.45	0.04
26.	0.55	0.11	0.45	0.04
27.	0.54	0.10	0.40	0.02
28.	0.54	0.10	0.38	0.02
29.	0.54	0.10	0.35	0.01
30.	0.54	0.10	0.35	0.01
31.			0.35	0.01

## MONTHLY DISCHARGE of Fornfeist Ditch near St. Kilda, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
September (16-31).....	0.20	0.09	0.12	4
October.....	0.23	0.01	0.13	8
The period.....				12

## MILK RIVER AT PENDANT D'OREILLE POLICE DETACHMENT.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 21, Tp. 2, Rge. 8, W. 4th Mer.

*Records available.*—August 5, 1909, to October 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 82.45 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand and shifts in change of stage.

*Discharge measurements.*—Made from a cable and car during high water, at low stages by wading.

*Observer.*—R. G. Lipton.



## SESSIONAL PAPER No. 25c

DISCHARGE MEASUREMENTS of Milk River at Pendant d'Oreille Police Detachment, in 1915.

Date.	Engineer.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 22.....	W. H. Storey.....	175.0	346.0	3.12	4.32	1,082
Mar. 27.....	do.....	169.0	228.0	1.51	3.41	345
April 13.....	do.....	155.0	131.8	1.50	3.05	198
April 19.....	do.....	67.0	87.0	1.80	2.95	156
April 21.....	do.....	68.0	79.0	1.66	2.83	130
May 5.....	do.....	157.0	191.4	1.55	3.35	300
May 18.....	do.....	162.0	262.6	2.03	3.70	534
June 1.....	G. H. Whyte and W. H. Storey.....	87.5	78.7	1.47	2.81	116
June 13.....	W. H. Storey.....	177.0	281.6	1.99	4.04	561
June 26.....	do.....	133.0	167.6	1.70	3.41	285
July 11.....	do.....	138.0	145.6	1.80	3.30	262
July 23.....	do.....	139.0	145.8	1.92	3.36	279
July 30.....	do.....	142.0	205.3	2.28	3.77	469
Aug. 10.....	do.....	71.0	85.6	1.65	3.00	141
Aug. 16.....	do.....	71.0	84.4	1.62	2.97	137
Aug. 28.....	do.....	69.5	65.7	1.56	2.89	102
Sept. 1.....	do.....	52.5	56.3	1.47	2.74	83
Sept. 2.....	do.....	53.0	61.4	1.55	2.82	95
Sept. 18.....	do.....	104.0	137.4	1.60	3.36	220
Sept. 19.....	do.....	102.0	136.6	1.55	3.30	213
Sept. 22.....	do.....	99.0	122.0	1.36	3.19	166
Oct. 7.....	do.....	102.0	130.6	1.62	3.30	212
Oct. 11.....	do.....	103.0	135.2	1.62	3.35	219
Oct. 22.....	do.....	100.0	111.6	1.50	3.20	167
Oct. 28.....	do.....	100.0	95.4	1.62	3.10	154

DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Pendant d'Oreille Police Detachment, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.37	311	2.65	86	2.91	144
2.....			3.35	301	2.65	86	2.94	144
3.....			3.40	325	2.65	86	3.24	232
4.....			3.00	700	2.68	91	3.34	261
5.....			4.06	845	3.30	277	4.01	709
6.....			4.13	910	3.30	277	5.30	1,866
7.....			3.75	572	3.25	256	5.03	1,600
8.....			3.48	373	3.10	201	4.60	1,176
9.....			3.40	325	3.01	172	4.12	718
10.....			3.28	260	2.95	155	3.70	367
11.....			3.18	229	2.95	155	3.65	323
12.....			3.14	215	2.87	134	3.51	248
13.....			3.05	185	2.85	129	3.96	492
14.....			3.00	169	2.90	141	3.71	337
15.....			3.01	172	2.95	155	3.60	287
16.....	4.05a	70	3.00	169	3.11	205	3.56	277
17.....	4.07	95	2.95	155	3.52	399	3.85	454
18.....	4.22	120	2.95	155	3.70	530	3.65	337
19.....	4.28	240	2.94	152	3.65	492	3.70	379
20.....	4.20	450	2.91	144	3.60	454	3.75	426
21.....	6.91	1,400	2.83	124	8.58	440	3.85	507
22.....	4.32	1,080	2.82	122	3.45	355	3.80	484
23.....	5.98	1,000	2.80	117	3.40	325	3.65	392
24.....	4.92	1,250	2.82	122	3.25	256	3.58	355
25.....	4.42	1,150	2.80	117	3.15	219	3.35	352
26.....	3.95a	700	2.75	106	3.09	198	3.41	282
27.....	3.30	277	2.74	104	3.00	160	5.11	1,649
28.....	3.32	287	2.75	106	2.94	152	4.55	1,123
29.....	3.41	331	2.74	104	2.90	141	4.13	738
30.....	3.40	325	2.70	95	2.85	129	4.25	843
31.....	3.43	343			2.82	122		

a to a interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Pendant d'Oreille Police Detachment, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge	Gauge Height	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.80	488	3.82	502	2.76	87	3.15	158
2.....	3.70	429	3.68	418	2.83	102	3.18	166
3.....	3.60	375	3.45	302	2.85	104	3.20	171
4.....	3.50	325	3.45	302	2.95	128	3.21	174
5.....	3.60	375	3.43	293	3.24	209	3.21	174
6.....	3.55	350	3.35	258	4.19	764	3.25	187
7.....	3.65	402	3.25	220	3.65	386	3.30	202
8.....	3.60	375	3.15	187	3.40	263	3.29	199
9.....	3.48	316	3.05	157	3.28	216	3.31	205
10.....	3.52	335	3.00	143	3.20	187	3.35	219
11.....	3.35	258	2.98	138	3.20	183	3.35	219
12.....	3.20	202	2.95	130	3.25	199	3.32	209
13.....	3.35	258	2.95	130	3.46	275	3.30	202
14.....	3.25	220	2.95	130	3.45	271	3.25	187
15.....	3.28	231	2.94	128	3.45	267	3.31	205
16.....	3.45	302	2.97	136	3.40	242	3.30	202
17.....	3.35	258	3.00	143	3.39	234	3.30	202
18.....	3.25	220	2.96	133	3.35	220	3.29	199
19.....	3.17	193	2.93	126	3.30	202	3.29	199
20.....	3.35	258	3.15	187	3.25	187	3.27	192
21.....	3.99	620	3.11	174	3.18	166	3.21	174
22.....	3.54	345	3.05	157	3.20	171	3.20	171
23.....	3.35	258	3.20	202	3.18	166	3.17	163
24.....	3.33	250	3.15	187	3.15	158	3.15	158
25.....	3.28	231	3.10	171	3.15	158	3.15	158
26.....	3.25	220	3.05	157	3.14	155	3.15	158
27.....	3.23	213	3.05	157	3.12	149	3.13	152
28.....	3.22	209	2.89	116	3.15	158	3.05	133
29.....	3.44	297	2.87	111	3.16	160	3.05	133
30.....	3.86	527	2.82	100	3.16	160	3.08	140
31.....	3.94	583	2.77	89	.....	.....	3.05	133

## MONTHLY DISCHARGE of Milk River at Pendant d'Oreille Police Detachment, for 1915.

(Drainage area 2,169 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (16-31).....	1,400	70	570	0.263	0.16	18,089
April.....	910	95	260	0.120	0.13	15,471
May.....	530	86	226	0.104	0.12	13,896
June.....	1,866	144	580	0.267	0.30	34,512
July.....	620	193	320	0.148	0.17	19,676
August.....	502	89	187	0.086	0.10	11,498
September.....	764	87	211	0.097	0.11	12,555
October.....	219	133	179	0.083	0.10	11,006
The period.....	.....	.....	.....	.....	1.19	138,703

## SESSIONAL PAPER No. 25c

## MILK RIVER AT SPENCER'S LOWER RANCH.

*Location.*—South of SE.  $\frac{1}{4}$  Sec. 3, Tp. 1, Rge. 5, W. 4th Mer., on NE. 6-37N.-9 E.P.M., Montana, U.S.A.

*Records available.*—Aug. 7, 1909, to December 25, 1915.

*Gauge.*—Gurley automatic water stage register installed in a wooden shelter, 300 feet south of the international boundary, with a staff gauge inside the stilling box and another outside at the mouth of the intake pipe. Gauges are maintained at an elevation of 2,696.58 feet.

*Bench-mark.*—Permanent iron bench-mark, Elevation, 2,713.64 feet (U.S.G.S. Havre datum), located 1,300 feet upstream from the boundary line, on the left bank.

*Channel.*—Composed of gravel, rock and quicksand and is subject to shifting conditions.

*Discharge measurements.*—Made by wading at low stages and by a cable car structure at high stages.

*Winter flow.*—From December to April the stream is frozen over and no records of value are obtained.

*Observer.*—Frank Galloway.

*Co-operation.*—This station is maintained in conjunction with United States Geological Survey.

## DISCHARGE MEASUREMENTS of Milk River at Spencer's Lower Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar 25-26.....	W. H. Storey.....	138.0	199.5	2.28	4.03	454
April 14.....	B. E. Jones <i>a</i> .....	56.0	84.0	2.32	3.09	195
April 14.....	W. H. Storey.....	66.0	92.7	2.13	3.15	196
April 15.....	do.....	65.0	88.9	2.10	3.10	186
April 20.....	do.....	62.5	81.8	1.85	3.04	152
April 28.....	B. E. Jones <i>a</i> .....	33.5	49.0	2.12	2.96	104
May 6.....	W. H. Storey.....	162.0	169.1	1.59	3.51	268
May 25.....	B. E. Jones <i>a</i> .....	58.0	92.0	2.11	3.28	194
June 2.....	G. H. Whyte and W. H. Storey	58.5	89.7	2.21	3.51	198
June 11.....	W. H. Storey.....	112.0	185.8	2.09	3.94	388
June 17.....	B. E. Jones <i>a</i> .....	69.0	118.0	2.89	3.85	341
June 28.....	W. H. Storey.....	131.0	317.6	4.68	5.54	1,488
July 9.....	B. E. Jones <i>a</i> .....	76.0	124.0	2.72	3.95	337
July 26.....	W. H. Storey.....	120.0	146.8	1.76	3.70	259
Aug. 5.....	B. E. Jones <i>a</i> .....	61.5	102.0	2.90	3.87	296
Aug. 12.....	W. H. Storey.....	53.0	67.8	1.93	3.24	131
Aug. 23.....	W. A. Lamb <i>a</i> .....	50.0	68.0	2.13	3.27	145
Aug. 30.....	W. H. Storey.....	50.0	58.8	1.77	3.09	104
Sept. 18.....	W. A. Lamb <i>a</i> .....	62.0	98.0	2.27	3.75	222
Sept. 20.....	W. H. Storey.....	97.0	121.1	1.74	3.60	211
Oct. 8.....	do.....	61.0	90.0	2.53	3.70	228
Oct. 27.....	do.....	60.0	80.2	2.21	3.61	177
Nov. 22.....	W. A. Lamb <i>a</i> .....	37.0	63.0	1.43	3.75	90

*a* U. S. G. S.

## DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Spencer's Lower Ranch, for 1915.

Day	March		April		May		June	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.
1.....			3.64	276	2.88	100	3.23	180
2.....			3.55	245	2.88	100	3.68	265
3.....			3.55	245	2.88	100	4.10	470
4.....			3.60	262	2.89	102	3.90	365
5.....			4.35	709	3.00	123	3.85	341
6.....			4.50	891	3.43	239	5.20	1,220
7.....			5.00	1,367	3.60	300	5.00	1,060
8.....			4.25	754	3.42	236	4.85	948
9.....			3.70	406	3.28	192	4.60	772
10.....			3.60	359	3.23	178	4.35	614
11.....			3.40	279	3.19	168	4.10	470
12.....			3.43	290	3.11	148	4.85	948
13.....			3.38	272	3.09	143	3.86	346
14.....			3.15	202	3.14	155	4.10	470
15.....	4.90a	60	3.08	187	3.38	223	3.93	380
16.....	5.00	70	3.11	189	3.47	253	3.88	355
17.....	5.10	80	3.15	194	3.39	226	3.90	365
18.....	5.20	120	3.15	189	4.10	540	4.20	525
19.....	5.25	250	3.13	180	4.00	485	4.20	525
20.....	5.55	450	3.11	168	3.84	403	4.15	498
21.....		850	3.11	164	3.72	349	4.25	554
22.....		1,400	3.08	153	3.63	312	4.35	614
23.....		1,400	3.05	143	3.59	296	4.15	498
24.....		1,750	3.06	141	3.53	274	3.89	360
25.....		800	3.05	136	3.40	229	3.82	327
26.....	4.77	400	3.03	130	3.33	205	3.75	295
27.....	4.76	380	3.00	119	3.30	197	4.20	525
28.....	4.34	360	3.26	166	3.23	180	4.85	948
29.....	3.93	320	2.88	100	3.20	173	4.50	644
30.....	3.63	275	2.88	100	3.18	168	4.45	610
31.....	3.58a	250			3.12	156		

a to a Estimated.

Ice going out March 21 to 25.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Milk River at Spencer's Lower Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	4.40	577	4.30	515	3.02	97	3.44	166	3.45	136	3.85	65
2.	4.20	458	4.15	432	3.04	100	3.44	166	3.49	143	3.68	63
3.	3.62	221	3.93	330	3.09	108	3.54	187	3.53	151	3.90	62
4.	3.86	302	3.75	262	3.46	180	3.55	189	3.54	153	4.00	62
5.	3.87	306	3.82	287	3.24	134	3.54	187	3.54	153	4.05	61
6.	3.99	355	3.82	287	3.82	287	3.56	189	3.55	156	4.10	59
7.	3.92	325	3.72	252	4.30	515	3.65	212	3.54	153	4.17	57
8.	3.96	339	3.59	212	3.59	309	3.71	230	3.54	153	4.25	55
9.	3.99	355	3.50	189	3.74	252	3.75	239	3.51	147	4.25	53
10.	3.95	338	3.40	166	3.63	215	3.70	224	3.45	136	4.30	51
11.	3.81	283	3.32	149	3.54	189	3.79	248	.....a	132	4.30	49
12.	3.74	259	3.26	137	3.47	171	3.80	252	.....	128	4.36	48
13.	4.45	610	3.24	134	3.46	166	3.75	233	.....b	124	4.35	47
14.	3.80	279	3.25	136	3.53	180	3.69	212	3.56	120	4.30	45
15.	3.53	197	3.30	145	3.69	218	3.70	215	3.45	116	4.15	40
16.	3.52	194	3.51	192	3.70	215	3.74	224	3.43	112	4.10	39
17.	3.86	302	3.74	259	3.69	210	3.75	224	3.40	108	4.12	39
18.	3.72	252	3.42	171	3.66	197	3.74	221	3.45	104	4.05	37
19.	3.61	218	3.60	215	3.63	205	.....	213	3.60	101	4.05	37
20.	3.57	207	3.92	325	3.58	210	3.70	205	3.72	98	4.02	35
21.	4.00	359	3.40	166	3.53	194	3.65	192	3.70	94	4.20	38
22.	4.15	432	3.30	145	3.49	184	3.61	180	3.80	90	4.10	33
23.	4.00	359	3.30	145	3.46	178	3.55	164	3.94	88	4.08	29
24.	3.79	276	3.46	180	3.44	171	3.54	162	4.14	86	4.05	27
25.	3.69	242	3.40	166	3.43	168	3.55	162	4.14	84	4.05	25
26.	3.65	230	3.24	134	3.43	168	3.57	164	4.18	81	.....a	25
27.	3.52	194	3.26	137	3.42	164	3.57	162	4.20	79	.....	25
28.	3.56	205	3.20	126	3.42	164	3.53	151	4.10	77	.....	25
29.	4.15	432	3.13	114	3.42	164	3.50	145	4.02	73	.....	25
30.	4.10	406	3.10	109	3.45	168	3.46	137	4.01	72	.....	25
31.	4.15	432	3.06	103	.....	.....	3.45	136	.....	.....	.....b	25

a to b No gauge height records; discharge estimated.

## MONTHLY DISCHARGE of Milk River at Spencer's Lower Ranch, for 1915.

(Drainage area 2,514 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
March (15-31)	1,750	60.	542	0 216	0 137	18,271
April	1,367	100	300	0 119	0 133	17,851
May	540	100	224	0 089	0 103	13,773
June	1,220	180	550	0 219	0 244	32,727
July	610	194	321	0 127	0 146	19,676
August	515	103	204	0 081	0 093	12,343
September	515	97	196	0 078	0 087	11,663
October	252	136	193	0 077	0 089	11,867
November	156	72	115	0 046	0 051	6,843
December	65	25	42	0 017	0 020	2,382
The period					1 103	147,796

STUDY OF CONDITIONS OF RUN-OFF in watershed of Milk River from its headwaters to its eastern crossing from Canada, Sec. 3. Tp. 1. Rge. 5, W. of 4th Mer., August 1 to October 31, 1915.

Station	Area of watershed in square miles						Run-off in Acre-feet.		Run-off per Square mile in Acre-feet.	
	Additional to last station.			Total for Station			Additional to last Station	Total for Station	For Additional Area.	For total Area.
	Canada	U.S.A.	Total	Canada	U.S.A.	Total				
Peters' Ranch (N. Br.), 11-1-23-4				10	91	101		13,311		131.79
Mackie's Ranch (S. Br.), 31-1-18-4				90	414	504		17,205		34.12
Milk River, 28-2-16-4	477	22	499	577	527	1,104	+3,963	34,479	7.94	31.22
Writing-on-Stone, 35-1-13-4	340	102	442	917	629	1,546	- 374	34,105	0.00	22.06
Pendant d'Oreille, 16-2-8-4	468	155	623	1,385	784	2,169	+ 954	35,059	1.53	10.16
Spencer's Lower Ranch, 3-1-5-4	242	103	345	1,627	887	2,514	+1,104	36,073	2.94	14.38

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Milk River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
Mar. 29	W. H. Story	Bear Gulch Creek	Sec. 30-2-9-4	8.0	2.80	0.40	1.190
April 12	do	do	do	9.0	2.70	0.39	1.050
April 22	do	do	do	4.5	1.32	0.27	0.360
May 4	do	do	do	2.3	0.39	1.03	0.400
May 19	do	do	do	7.0	2.35	1.58	3.720
June 14	do	do	do	11.0	9.00	0.61	5.500
June 25	do	do	do	5.5	6.15	1.54	9.500
July 12	do	do	do	6.0	2.30	0.82	1.880
July 23	do	do	do	6.5	3.20	0.90	2.870
July 30	do	do	do	9.0	5.00	1.58	7.900
Aug. 9	do	do	do	6.0	2.30	0.80	1.850
Aug. 17	do	do	do	10.0	7.10	1.18	8.400
Aug. 27	do	do	do				0.217a
Sept. 3	do	do	do				0.171a
Sept. 17	do	do	do	5.0	1.50	0.35	0.530
Sept. 23	do	do	do	4.0	1.70	0.33	0.560
Oct. 6	do	do	do	4.5	2.00	0.24	0.450
Oct. 12	do	do	do	4.5	1.80	0.23	0.420
Oct. 21	do	do	do	2.5	0.49	0.33	0.160
Oct. 29	do	do	do	4.0	0.80	0.34	0.270
Oct. 12	do	Beaver Oil Well Artesian flow	SE. 24-2-11-4				0.360a
Oct. 12	do	do	do	2.4	0.68	0.56	0.380
Oct. 29	do	do	do	1.8	0.42	0.74	0.310
June 14	do	Couleee	SE. 14-2-11-4	5.0	2.10	0.76	1.600
June 25	do	do	do				Nil.
July 12	do	do	do				"
July 23	do	do	do				"
July 30	do	do	do	5.0	1.80	0.41	0.740
Aug. 9	do	do	do				Nil.
Aug. 17	do	do	do				"
Aug. 27	do	do	do				"
Sept. 3	do	do	do				"
Sept. 17	do	do	do				"
Sept. 23	do	do	do				"
Oct. 6	do	do	do				"
Oct. 12	do	do	do				"
Oct. 21	do	do	do				"
Oct. 29	do	do	do				"
Mar. 20	do	do	Sec. 19-2-11-4	6.0	2.40	0.37	0.880
Mar. 20	do	do	Sec. 30-2-10-4	10.0	13.40	0.70	9.360
April 7	do	do	Sec. 21-2-17-4	8.0	3.10	0.35	1.100
April 27	do	do	do				Nil.
May 25	G. H. Whyte and W. H. Storey	do	do				"
June 21	W. H. Storey	do	do	5.0	1.70	0.39	0.670
July 18	do	do	do				Nil.
Aug. 4	do	do	do				"
Aug. 23	do	do	do				"
Sept. 9	do	do	do				"
Sept. 29	do	do	do				"
Oct. 17	do	do	do				"

a Weir measurement.

# MILK RIVER DRAINAGE BASIN

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SESSIONAL PAPER No. 25c

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Milk River drainage basin, in 1915.  
—Continued.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
Mar. 29.....	W. H. Storey.....	Dead Horse Creek..	Sec. 4-2-11-4.....	6.0	2.70	0.80	2.170
April 12.....	do.....	do.....	do.....	6.0	1.70	0.60	1.080
May 4.....	do.....	do.....	do.....	2.2	0.42	0.55	0.230
May 19.....	do.....	do.....	do.....	3.0	1.04	0.49	Nil.
May 31.....	G. H. Whyte and W. H. Storey.....	do.....	do.....				0.510
June 14.....	do.....	do.....	do.....	6.0	4.80	0.98	Nil.
June 25.....	do.....	do.....	do.....	5.0	4.30	0.71	4.700
July 12.....	do.....	do.....	do.....	4.5	1.25	0.40	3.000
July 22.....	do.....	do.....	do.....				0.500
July 30.....	do.....	do.....	do.....	8.0	2.60	1.27	0.125a
Aug. 9.....	do.....	do.....	do.....				3.300
Aug. 17.....	do.....	do.....	do.....				Nil.
Aug. 27.....	do.....	do.....	do.....				"
Sept. 3.....	do.....	do.....	do.....				"
Sept. 17.....	do.....	do.....	do.....				"
Sept. 23.....	do.....	do.....	do.....	6.0	1.30	0.32	0.093a
Oct. 6.....	do.....	do.....	do.....				0.410
Oct. 12.....	do.....	do.....	do.....	6.0	1.40	0.32	0.018a
Oct. 21.....	do.....	do.....	do.....				0.450
Oct. 29.....	do.....	do.....	do.....				0.171a
Mar. 19.....	do.....	Deer Creek.....	NE. 26-1-12-4.....	6.0	1.50	0.88	0.194a
Mar. 29.....	do.....	do.....	do.....	5.0	0.90	0.58	1.320
April 12.....	do.....	do.....	do.....	6.0	1.90	0.58	0.450
April 22.....	do.....	do.....	do.....	4.0	0.95	1.25	1.100
May 4.....	do.....	do.....	do.....	3.2	1.03	0.61	1.190
May 19.....	do.....	do.....	do.....	5.0	3.10	2.49	0.630
June 15.....	do.....	do.....	do.....	12.0	8.90	0.67	7.720
June 24.....	do.....	do.....	do.....	9.0	4.30	1.52	6.000
July 12.....	do.....	do.....	do.....	8.0	2.50	1.04	6.500
July 22.....	do.....	do.....	do.....	9.0	3.70	0.68	2.600
Aug. 8.....	do.....	do.....	do.....	11.5	7.70	0.71	2.530
Aug. 17.....	do.....	do.....	do.....	6.0	2.30	0.75	5.500
Aug. 26.....	do.....	do.....	do.....	5.0	1.50	0.48	1.730
Sept. 3.....	do.....	do.....	do.....	7.0	2.10	0.35	0.720
Sept. 16.....	do.....	do.....	do.....	7.0	2.00	0.44	0.730
Sept. 23.....	do.....	do.....	do.....	3.5	1.17	0.54	0.890
Oct. 5.....	do.....	do.....	do.....	5.0	2.00	0.31	0.630
Oct. 12.....	do.....	do.....	do.....	8.0	3.00	0.48	0.610
Oct. 20.....	do.....	do.....	do.....	7.0	1.60	0.51	1.430
Oct. 29.....	do.....	do.....	do.....	7.0	1.70	0.49	0.810
April 23.....	do.....	Dickinson Ditch..	SW. 15 1-12-4.....	5.0	1.40	0.62	0.830
May 3.....	do.....	do.....	do.....	2.9	0.90	0.47	0.870
June 15.....	do.....	do.....	do.....				0.420
June 24.....	do.....	do.....	do.....				Nil.
July 22.....	do.....	do.....	do.....				"
Aug. 8.....	do.....	do.....	do.....				"
Aug. 18.....	do.....	do.....	do.....				0.388a
Aug. 26.....	do.....	do.....	do.....				0.109a
Sept. 4.....	do.....	do.....	do.....				0.388a
Sept. 16.....	do.....	do.....	do.....				0.288a
Sept. 24.....	do.....	do.....	do.....				0.109a
Oct. 9.....	do.....	do.....	do.....				0.148a
Oct. 13.....	do.....	do.....	do.....				0.109a
Oct. 20.....	do.....	do.....	do.....				0.093a
Mar. 18.....	do.....	Davis Coulee.....	SE. 35-1-13-4.....				0.109a
Mar. 30.....	do.....	do.....	do.....				0.125a
April 11.....	do.....	do.....	do.....				"
April 22.....	do.....	do.....	do.....				Nil.
May 2.....	do.....	do.....	do.....				"
May 20.....	do.....	do.....	do.....				"
May 30.....	G. H. Whyte and W. H. Storey.....	do.....	do.....				"
June 15.....	do.....	do.....	do.....				"
June 23.....	do.....	do.....	do.....	7.0	2.90	0.37	1.080
July 13.....	do.....	do.....	do.....	4.0	0.60	0.27	Nil.
July 21.....	do.....	do.....	do.....				0.160
July 30.....	do.....	do.....	do.....	5.0	1.00	0.40	Nil.
Aug. 7.....	do.....	do.....	do.....				0.400
Aug. 18.....	do.....	do.....	do.....				Nil.
Aug. 25.....	do.....	do.....	do.....				"
Sept. 4.....	do.....	do.....	do.....				"
Sept. 15.....	do.....	do.....	do.....				0.061a
Sept. 24.....	do.....	do.....	do.....				Nil.
Oct. 2.....	do.....	do.....	do.....				"
Oct. 4.....	do.....	do.....	do.....				"

a Weir measurements.

b Small trickle, too small to measure.



MISCELLANEOUS DISCHARGE MEASUREMENTS made in Milk River drainage basin, in 1915.  
—Continued.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Dis-charge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
Oct. 13.....	W. H. Storey.....	Davis Coulee.....	SE. 35-1-13-4.....	.....	.....	.....	Nil.
Oct. 19.....	do.....	do.....	do.....	.....	.....	.....	"
Oct. 30.....	do.....	do.....	do.....	.....	.....	.....	"
May 3.....	do.....	Spring at Drader Ranch.....	SE. 9-1-12-4.....	.....	.....	.....	0.011a
May 24.....	do.....	do.....	do.....	.....	.....	.....	0.011
Aug. 8.....	do.....	do.....	do.....	.....	.....	.....	0.004a
Mar. 29.....	do.....	Half-Breed Creek.....	Sec. 28-2-10-4.....	.....	4.47	0.59	2.630
April 12.....	do.....	do.....	do.....	7.0	2.90	0.54	2.060
April 22.....	do.....	do.....	do.....	5.0	1.00	0.75	2.050
May 4.....	do.....	do.....	do.....	.....	.....	.....	0.367a
May 19.....	do.....	do.....	do.....	10.5	4.35	0.66	3.520
June 14.....	do.....	do.....	do.....	13.0	7.80	0.46	3.600
June 25.....	do.....	do.....	do.....	24.0	13.20	0.80	10.600
July 12.....	do.....	do.....	do.....	9.0	3.10	0.56	2.600
July 23.....	do.....	do.....	do.....	11.0	4.20	0.66	4.020
July 30.....	do.....	do.....	do.....	7.5	2.68	1.30	7.320
Aug. 9.....	do.....	do.....	do.....	.....	.....	.....	2.600a
Aug. 17.....	do.....	do.....	do.....	6.0	1.30	0.42	0.540
Aug. 27.....	do.....	do.....	do.....	.....	.....	.....	0.385a
Sept. 3.....	do.....	do.....	do.....	.....	.....	.....	0.061a
Sept. 17.....	do.....	do.....	do.....	6.0	1.60	0.39	0.620
Sept. 23.....	do.....	do.....	do.....	4.5	1.90	0.30	0.570
Oct. 6.....	do.....	do.....	do.....	7.0	1.70	0.40	0.960
Oct. 12.....	do.....	do.....	do.....	7.5	1.85	0.35	0.910
Oct. 21.....	do.....	do.....	do.....	5.0	1.30	0.66	0.860
Oct. 29.....	do.....	do.....	do.....	5.0	1.06	0.69	1.000
Mar. 25.....	do.....	Kennedy Creek.....	SE. 3-1-5-4.....	10.5	8.37	0.82	5.220
April 14.....	do.....	do.....	do.....	.....	.....	.....	Nil.
April 15.....	do.....	do.....	do.....	.....	.....	.....	"
April 20.....	do.....	do.....	do.....	.....	.....	.....	"
May 6.....	do.....	do.....	do.....	.....	.....	.....	"
June 2.....	G. H. Whyte and W. H. Storey.....	do.....	do.....	.....	.....	.....	"
June 11.....	W. H. Storey.....	do.....	do.....	.....	.....	.....	"
June 28.....	do.....	do.....	do.....	10.5	6.82	0.67	4.600
July 26.....	do.....	do.....	do.....	.....	.....	.....	Nil.
Aug. 12.....	do.....	do.....	do.....	.....	.....	.....	"
Aug. 30.....	do.....	do.....	do.....	.....	.....	.....	"
Sept. 20.....	do.....	do.....	do.....	.....	.....	.....	"
Oct. 8.....	do.....	do.....	do.....	.....	.....	.....	"
Oct. 27.....	do.....	do.....	do.....	.....	.....	.....	"
Mar. 25.....	do.....	Lost River.....	Sec. 11-2-5-4.....	12.0	7.40	0.67	4.930
May 4.....	do.....	Macdonald Creek.....	Sec. 32-1-11-4.....	.....	.....	.....	0.138a
May 19.....	do.....	do.....	do.....	5.0	1.60	0.40	0.640
June 14.....	do.....	do.....	do.....	8.0	3.90	0.51	2.000
June 25.....	do.....	do.....	do.....	8.0	4.10	0.55	2.270
July 12.....	do.....	do.....	do.....	4.0	1.20	0.78	0.940
July 22.....	do.....	do.....	do.....	.....	.....	.....	0.171a
July 30.....	do.....	do.....	do.....	8.0	3.00	0.48	1.440
Aug. 9.....	do.....	do.....	do.....	.....	.....	.....	Nil.
Aug. 17.....	do.....	do.....	do.....	.....	.....	.....	"
Aug. 26.....	do.....	do.....	do.....	.....	.....	.....	"
Sept. 3.....	do.....	do.....	do.....	.....	.....	.....	0.125a
Sept. 17.....	do.....	do.....	do.....	4.0	0.80	0.31	0.250
Sept. 23.....	do.....	do.....	do.....	.....	.....	.....	0.027a
Oct. 6.....	do.....	do.....	do.....	5.0	1.10	0.32	0.350
Oct. 12.....	do.....	do.....	do.....	.....	.....	.....	0.171a
Oct. 21.....	do.....	do.....	do.....	.....	.....	.....	0.148a
Oct. 29.....	do.....	do.....	do.....	.....	.....	.....	0.171a
April 6.....	do.....	Mackie Creek.....	Sec. 19-2-18-4.....	4.0	1.40	0.57	0.800
April 28.....	do.....	do.....	do.....	5.0	1.80	0.48	0.620
June 21.....	do.....	do.....	do.....	6.0	2.70	0.73	1.960
July 18.....	do.....	do.....	do.....	12.0	7.40	0.56	4.200
Aug. 4.....	do.....	do.....	do.....	11.5	6.30	0.54	3.400
Aug. 24.....	do.....	do.....	do.....	10.5	4.90	0.54	2.650
Sept. 9.....	do.....	do.....	do.....	6.0	2.50	0.96	2.400
Sept. 29.....	do.....	do.....	do.....	8.0	3.80	0.66	2.500
Oct. 17.....	do.....	do.....	do.....	7.5	3.55	0.69	2.400
Mar. 29.....	do.....	Miners Creek.....	Sec. 10-2-11-4.....	6.0	2.80	0.76	2.120
April 12.....	do.....	do.....	do.....	7.0	2.50	0.60	1.520
April 22.....	do.....	do.....	do.....	4.2	1.58	0.51	0.810
May 4.....	do.....	do.....	do.....	.....	.....	.....	0.229a
May 19.....	do.....	do.....	do.....	9.0	5.00	0.78	3.920
May 31.....	G. H. Whyte and W. H. Storey.....	do.....	do.....	.....	.....	.....	b
June 14.....	W. H. Storey.....	do.....	do.....	12.0	9.40	0.92	8.700
June 25.....	do.....	do.....	do.....	9.0	7.10	0.70	5.000
July 12.....	do.....	do.....	do.....	7.0	3.20	0.80	2.600

a Weir measurement.

b Small trickle, too small to measure.

## SESSIONAL PAPER No. 25c

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Milk River drainage basin, in 1915.

—Continued.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
July 23.....	W. H. Storey.....	Miners Creek.....	Sec. 10-2-11-4.....	7.0	3.60	0.85	3.060
July 30.....	do.....	do.....	do.....	9.0	5.00	1.44	7.200
Aug. 9.....	do.....	do.....	do.....	7.0	2.90	0.75	2.200
Aug. 17.....	do.....	do.....	do.....	4.5	0.89	0.39	0.350
Aug. 27.....	do.....	do.....	do.....				0.258a
Sept. 3.....	do.....	do.....	do.....				0.125a
Sept. 17.....	do.....	do.....	do.....	6.0	1.70	0.42	0.720
Sept. 23.....	do.....	do.....	do.....	5.0	1.00	0.36	0.360
Oct. 6.....	do.....	do.....	do.....	7.0	2.00	0.47	0.930
Oct. 12.....	do.....	do.....	do.....	6.0	2.10	1.00	2.110
Oct. 21.....	do.....	do.....	do.....	5.5	1.83	0.58	1.070
Oct. 29.....	do.....	do.....	do.....	5.0	1.40	0.84	1.170
Mar. 13.....	do.....	Police Creek.....	SW. 35-1-13-4.....	5.5	2.22	1.15	2.560
Mar. 17.....	do.....	do.....	do.....	9.0	5.20	1.47	7.640
Oct. 30.....	do.....	do.....	do.....	6.5	2.72	0.52	1.420
April 2.....	do.....	do.....	do.....	10.0	7.50	0.80	6.050
April 11.....	do.....	do.....	do.....	7.0	3.00	0.51	1.540
April 23.....	do.....	do.....	do.....	6.0	1.75	0.46	0.800
May 2.....	do.....	do.....	do.....	5.0	0.65	0.35	0.220
May 20.....	do.....	do.....	do.....	4.0	0.90	0.29	0.960
May 29.....	G. H. Whyte and W. H. Storey.....	do.....	do.....				0.42a
June 15.....	W. H. Storey.....	do.....	do.....	13.0	15.00	0.51	7.600
June 23.....	do.....	do.....	do.....	11.5	5.50	0.45	2.500
July 13.....	do.....	do.....	do.....	8.0	3.20	0.52	1.650
July 21.....	do.....	do.....	do.....	8.0	2.90	0.51	1.470
July 30.....	do.....	do.....	do.....	12.0	7.50	0.56	4.200
Aug. 7.....	do.....	do.....	do.....	9.0	4.20	0.57	2.400
Aug. 18.....	do.....	do.....	do.....	4.0	0.70	0.40	0.280
Aug. 25.....	do.....	do.....	do.....	5.0	1.34	0.42	0.560
Sept. 4.....	do.....	do.....	do.....	6.0	2.30	0.54	1.240
Sept. 15.....	do.....	do.....	do.....	6.5	1.87	0.65	1.210
Sept. 24.....	do.....	do.....	do.....				0.240a
Oct. 2.....	do.....	do.....	do.....	6.0	1.30	0.44	0.570
Oct. 4.....	do.....	do.....	do.....	6.5	2.30	0.60	1.390
Oct. 13.....	do.....	do.....	SE. 3-1-13-4.....	5.0	2.50	0.99	2.500
Oct. 13.....	do.....	do.....	SW. 35-1-13-4.....	9.0	3.10	0.46	1.430
Oct. 19.....	do.....	do.....	do.....	9.0	2.90	0.43	1.240
Oct. 19.....	do.....	do.....	do.....	6.0	1.60	0.44	0.700
Oct. 30.....	do.....	do.....	do.....				
Mar. 16.....	do.....	Red Creek.....	Sec. 18-1-15-4.....	11.0	5.90	1.26	7.430
April 10.....	do.....	do.....	do.....	4.0	0.70	0.30	0.210
May 1.....	do.....	do.....	do.....	4.0	0.80	0.29	0.230
May 21.....	do.....	do.....	do.....				Nil.
June 16.....	do.....	do.....	do.....				"
June 22.....	do.....	do.....	do.....				"
July 14.....	do.....	do.....	do.....				"
Aug. 1.....	do.....	do.....	do.....				"
Sept. 5.....	do.....	do.....	do.....				"
Sept. 25.....	do.....	do.....	do.....				"
Oct. 1.....	do.....	do.....	Sec 35-1-15-4.....				"
Oct. 14.....	do.....	do.....	do.....				"
Oct. 19.....	do.....	do.....	do.....				"
Oct. 31.....	do.....	do.....	do.....				"
Mar. 13.....	do.....	Rocky Coulee.....	SW. 35-1-13-4.....	5.0	1.90	0.79	1.500
Mar. 17.....	do.....	do.....	do.....	7.0	2.50	0.85	2.120
Mar. 30.....	do.....	do.....	do.....				Nil.
April 11.....	do.....	do.....	do.....				"
April 23.....	do.....	do.....	do.....				"
May 2.....	do.....	do.....	do.....				"
May 20.....	do.....	do.....	do.....				"
May 30.....	G. H. Whyte and W. H. Storey.....	do.....	do.....				"
June 15.....	W. H. Storey.....	do.....	do.....	7.0	2.90	0.41	1.180
June 23.....	do.....	do.....	do.....				0.151a
July 13.....	do.....	do.....	do.....	5.0	1.20	0.41	0.490
July 21.....	do.....	do.....	do.....				Nil.
July 30.....	do.....	do.....	do.....	6.0	2.30	0.60	1.390
Aug. 7.....	do.....	do.....	do.....				Nil.
Aug. 18.....	do.....	do.....	do.....				"
Aug. 25.....	do.....	do.....	do.....				"
Sept. 4.....	do.....	do.....	do.....				0.140a
Sept. 15.....	do.....	do.....	do.....				0.109a
Sept. 24.....	do.....	do.....	do.....				Nil.
Oct. 2.....	do.....	do.....	do.....				"
Oct. 4.....	do.....	do.....	do.....				"
Oct. 13.....	do.....	do.....	do.....				"
Oct. 19.....	do.....	do.....	do.....				"
Oct. 30.....	do.....	do.....	do.....				"
Aug. 17.....	H. R. Carscallen.....	Sage Creek.....	NW 15-1-2-4.....	9.00	53.83	0.88	47.000

a Weir measurement.

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Milk River drainage basin, in 1915.  
—Concluded.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	D's-charge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
May 4	W. H. Storey	Sims' Ditch	SE. 31-1-11-4				0.138 <sup>a</sup>
May 19	do	do	do	4.5	1.32	0.39	0.510
June 14	do	do	do				Nil.
June 25	do	do	do	4.0	1.30	0.39	0.510
July 12	do	do	do				Nil.
July 22	do	do	do				"
July 30	do	do	do				"
Aug. 9	do	do	do				"
Aug. 17	do	do	do				"
Aug. 27	do	do	do				"
Sept. 3	do	do	do				"
Sept. 17	do	do	do				"
Sept. 23	do	do	do				"
Oct. 6	do	do	do				"
Oct. 12	do	do	do				"
Oct. 21	do	do	do				Nil.
Oct. 29	do	do	do				1.180
Mar. 29	do	Spring Creek	SW. 31-1-11-4	5.5	2.10	0.56	0.480
April 12	do	do	do	5.0	1.00	0.48	Nil.
May 4	do	do	do				0.260
May 19	do	do	do	4.0	0.85	0.32	2.900
June 14	do	do	do	6.0	3.50	0.83	0.740
June 25	do	do	do	5.0	2.00	0.37	0.600
July 12	do	do	do	4.5	1.25	0.48	0.360 <sup>a</sup>
July 22	do	do	do				1.580
July 30	do	do	do	6.0	2.40	0.66	0.360 <sup>a</sup>
Aug. 9	do	do	do				0.350
Aug. 17	do	do	do	4.0	0.85	0.41	0.240 <sup>a</sup>
Aug. 27	do	do	do				0.171 <sup>a</sup>
Sept. 3	do	do	do	4.0	0.80	0.31	0.250
Sept. 16	do	do	do	4.0	0.70	0.20	0.140
Sept. 23	do	do	do	4.0	0.90	0.31	0.280
Oct. 6	do	do	do				0.148 <sup>a</sup>
Oct. 12	do	do	do	3.0	0.60	0.22	0.130
Oct. 21	do	do	do				0.045 <sup>a</sup>
Oct. 29	do	do	do				Nil.
Mar. 12	do	Verdigris Coulee	SE. 29-2-14-4				2.160
Mar. 14	do	do	do	6.50	3.00	0.72	0.330
April 2	do	do	do	4.50	0.85	0.39	Nil.
April 24	do	do	do				"
July 20	do	do	do				"
Aug. 6	do	do	do				"
Aug. 19	do	do	do				"
Aug. 25	do	do	do				"
Sept. 13	do	do	do				0.148 <sup>a</sup>
Mar. 13	do	Deer Creek	SW. 15-1-12-4	7.5	4.12	0.65	2.700
Mar. 19	do	do	do	6.0	1.40	0.91	1.270
April 22	do	do	do	6.0	1.90	0.98	1.870
May 3	do	do	do	4.7	1.17	0.82	0.960
June 25	do	Ditch on Fornieist Ranch	NW. 30-1-11-4				Nil.
July 22	do	do	Sec. 31-1-11-4				0.360 <sup>a</sup>
July 30	do	do	do				Nil.
Aug. 9	do	do	do				0.388 <sup>a</sup>
Aug. 17	do	do	do	5.0	0.81	0.37	0.300
Aug. 26	do	do	do				0.217 <sup>a</sup>
Sept. 3	do	do	do				Nil.
April 12	do	Ditch at Hall's Ranch	SE. 28-2-10-4	3.0	1.15	0.43	0.490
April 22	do	do	do	3.9	1.49	0.87	1.300
May 4	do	do	do				Nil.
	do	do	do	3.2	1.08	0.60	0.650
May 19	do	do	do				Nil.
June 14	do	do	do				0.860
June 25	do	do	do	4.0	1.55	0.55	1.250
July 12	do	do	do	4.3	2.06	0.61	3.800
July 23	do	do	do	3.8	1.98	1.93	2.100
July 30	do	do	do	3.8	1.42	1.46	Nil.
Aug. 9	do	do	do				"
Aug. 17	do	do	do				"
Aug. 27	do	do	do				"
Sept. 3	do	do	do				"
Sept. 17	do	do	do				0.280
Sept. 23	do	do	do	4.5	0.85	0.33	0.260
Oct. 6	do	do	do	4.5	0.85	0.31	Nil.
Oct. 12	do	do	do				0.060
Oct. 21	do	do	do	3.0	0.29	0.22	
Oct. 29	do	do	do				

<sup>a</sup> Weir measurement.

## PAKOWKI LAKE DRAINAGE BASIN.

*General Description.*

Pakowki Lake receives the drainage of the western slopes of the Cypress Hills, and a fair amount of water from the northern slopes of the Milk River Ridge. It also receives, via Etzikom Coulee, a certain amount of waste water from the Alberta Railway and Irrigation Company's canals. There is no outlet to this lake, the water level being about thirty feet lower than that of Milk River in Range 8, West of the 4th Meridian.

The streams within this drainage basin are very similar in their general characteristics, all having narrow, deep, and well defined valleys, with a growth of willows along the bottoms. Most of these creeks on the east side of the lake have considerable flats and meadows, covered with native grasses and sage brush, and are to a great extent irrigated from these creeks. During exceptionally heavy rainfall these creeks are subject to rapid rises and correspondingly rapid falls of stage. Canal Creek and the south branch of Manyberries Creek drain a considerable area of broken land, devoid of tilth, and the run-off from these creeks, contributed by deep coulees where the subsoil is exposed, is comparatively large, almost all the precipitation finding its way into the creek channels.

There are several irrigation works situated on Manyberries, Ketchum and Canal Creeks, all the water coming down from the higher ground, except during a very large run-off, being used in irrigating the lower flats, very little water being discharged into Pakowki Lake.

The yield of cultivated hays of different kinds, native hay and alfalfa, has been considerably increased by the use of these waters.

## ETZIKOM COULEE NEAR STIRLING.

*Location.*—On road allowance between SW.  $\frac{1}{4}$  Sec. 3, and SE.  $\frac{1}{4}$  Sec. 4, Tp. 7. Rge. 19, W. 4th Mer., at highway bridge, one mile north and east of Stirling.

*Records available.*—May 1, 1914, to Sept. 26, 1915.

*Drainage area.*—The run-off of this coulee was partly from its drainage area, but largely from the overflow of the Alberta Railway and Irrigation Company's irrigation ditch.

*Gauge.*—Vertical staff fastened to bridge pile on downstream side against north abutment. Elevation of zero maintained at 92.83 feet, since establishment.

*Bench-mark.*—Permanent iron bench-mark located 25 feet east of south end of bridge. Assumed elevation, 100.00 feet.

*Channel.*—Composed of clay and liable to be affected by the growth of weeds in bed.

*Discharge measurements.*—Owing to continuous high water in 1915 all measurements were made by wading. At low water stage a weir could be used, and at extreme high water measurements could be made from the traffic bridge.

*Observers.*—F. Adler (discontinued his observations Aug. 12, 1915). Nels H. Nelson (commenced making observations on Aug. 13, 1915).

## DISCHARGE MEASUREMENTS of Etzikom Coulee near Stirling, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
April 8.	W. H. Storey	30.5	62.00	1.45	3.95	90.00
April 20.	do	2.3	1.14	0.35	1.58	0.40
May 26.	W. R. McCaffrey	11.0	7.90	0.76	1.94	6.10
July 14.	do	17.0	15.00	0.97	2.39	15.40
July 26.	do	17.0	18.00	1.25	2.57	22.00
Aug. 12.	G. H. Whyte and W. R. McCaffrey	11.8	11.01	1.22	2.07	9.00
Aug. 25.	W. R. McCaffrey	11.0	11.10	1.00	2.16	11.00
Sept. 20.	do	12.0	11.20	1.05	2.17	11.80

## DAILY GAUGE HEIGHT AND DISCHARGE of Etzikom Coulee near Stirling, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3.07	39.40	1.52	0.11	1.77	2.92
2			3.07	39.40	1.50	0.05	1.82	3.76
3			3.07	39.40	1.50	0.05	2.14	10.66
4			3.40	53.90	2.20	12.10	2.99	36.20
5			3.15	42.70	1.93	5.90	3.40	53.90
6			3.03	37.80	2.13	10.42	3.25	47.00
7			2.85	30.90	1.65	1.20	3.10	40.60
8			2.43	17.78	1.70	1.90	2.72	26.38
9			2.91	33.08	1.72	2.13	2.68	25.06
10			2.62	23.20	1.69	1.76	2.25	13.30
11			2.28	14.02	1.68	1.62	2.10	9.70
12			2.20	12.10	1.72	2.18	2.07	8.98
13			2.20	12.10	1.73	2.32	2.05	8.50
14			2.00	7.40	1.74	2.46	2.05	8.50
15			2.00	7.40	2.35	15.70	2.02	7.84
16	1.86	4.50	2.00	7.40	2.52	20.26	2.02	7.84
17	2.01	7.62	2.01	7.62	2.40	17.00	1.87	4.70
18	3.40	53.90	2.05	8.50	2.38	16.48	1.84	4.12
19	6.52	314.36a	2.03	8.06	2.32	14.98	2.70	25.70
20	6.50	312.60a	2.00	7.40	2.50	19.70	2.71	26.04
21	6.45	308.20b	1.95	6.30	2.85	30.90	2.16	11.14
22	4.90	171.80	1.96	6.52	2.67	21.74	3.00	36.60
23	4.35	123.40	1.94	6.10	2.51	19.98	2.75	27.40
24	3.95	88.40	1.90	5.30	2.26	13.54	2.02	7.84
25	3.80	77.00	1.90	5.30	2.05	8.50	2.00	7.40
26	3.78	75.64	1.86	4.50	1.94	6.10	3.66	68.00
27	3.74	72.96	2.05	8.50	1.87	4.70	3.70	70.40
28	3.30	49.30	1.78	3.08	1.85	4.30	3.40	53.90
29	3.15	42.70	1.58	0.44	1.84	4.12	3.30	49.30
30	3.13	41.86	1.55	0.20	1.80	3.40	3.21	45.24
31	3.10	40.60	.....	.....	1.77	2.92	.....	.....

NOTE—Sudden fluctuations of gauge height and discharge due to strong winds blowing water down from 18-Mile Lake.

a Partial ice, water flooding over ice.

b Ice breaking up.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Etzikom Coulee near Stirling, for 1915.—*Concluded.*

DAY.	July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.15	42.70	2.55	21.10	1.95 <sup>b</sup>	6.30
2.....	3.07	39.40	2.56	21.40	1.95	6.30
3.....	3.02	37.40	2.60	22.60	2.42	17.52
4.....	3.05	38.60	2.58	22.00	2.25	13.30
5.....	3.05	38.60	2.55	21.10	2.10	9.70
6.....	3.05	38.60	2.55	21.10	2.15	10.90
7.....	3.30	49.30	2.46	18.58	2.18	11.62
8.....	3.21	45.24	2.47	18.86	2.18	11.62
9.....	3.05	38.60	2.44	18.04	2.10	9.70
10.....	2.96	35.00	2.43	17.78	2.10 <sup>b</sup>	9.70
11.....	2.66	24.42	2.43	17.78	2.09	9.46
12.....	2.50	19.70	2.05	8.50	2.05	8.50
13.....	2.45	18.30	2.12 <sup>c</sup>	10.18	2.05	8.50
14.....	2.38	16.48	2.40	17.00	2.05	8.50
15.....	2.28	14.02	2.40	17.00	1.93	5.90
16.....	2.27	13.78	2.40	17.00	2.12	10.18
17.....	2.36	15.96	2.50	19.70	2.15	10.90
18.....	2.50	19.70	1.95	6.30	2.28	14.02
19.....	2.50	19.70	2.25	13.30	2.15	10.90
20.....	2.54	20.82	2.50	19.70	2.25	13.70
21.....	2.56	21.40	2.30	14.50	2.25	13.30
22.....	2.53	20.54	2.25	13.30	2.15	10.90
23.....	2.57	21.70	2.40	17.00	2.23	12.82
24.....	2.58	22.00	2.25	13.30	2.30	14.50
25.....	2.60	22.60	2.16	11.14	2.25	13.30
26.....	2.57	21.70	2.15	10.90	2.17	11.38
27.....	2.38	16.48	2.09	9.46	4.05 <sup>a</sup>	.....
28.....	2.48	19.14	2.04	8.28	5.25	.....
29.....	2.54	20.82	2.02	7.84	5.73	.....
30.....	2.56	21.40	1.75	2.60	5.60	.....
31.....	2.53	20.54	1.95	6.30	.....	.....

<sup>a</sup> Coulee dammed below gauge, changing control, hence former discharge curve is not applicable to gauge heights from this date.<sup>b</sup> Interpolated.<sup>c</sup> Change in observers.

## MONTHLY DISCHARGE of Etzikom Coulee near Stirling, for 1915.

(Drainage area 203 square miles.) <sup>b</sup>

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
March (10-31).....	314.0	4.50	112.0	3,554
April.....	54.0	0.20	16.5	982
May.....	31.0	0.05	8.7	532
June.....	54.0	2.92	25.0	1,488
July.....	49.0	13.80	24.0	1,474
August.....	23.0	2.60	14.5	892
September (1-26).....	17.5	5.90	10.9	562
The period.....				9,486 <sup>a</sup>

<sup>a</sup> Mostly irrigation water, overflow from 18-Mile Lake.<sup>b</sup> Drainage area cannot be considered in monthly discharge computations.

## ETZIKOM COULEE NEAR GODDARD.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 2, Tp. 5, Rge. 13, W. 4th Mer., at outlet of Crow Indian Lake.

*Records available.*—May 28, 1915, to October 31, 1915.

*Gauge.*—Vertical staff. Maintained at zero elevation of 96.31 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Gravel and sand, not liable to change.

*Discharge measurements.*—Made by wading.

*Observer.*—Wm. Rutherford.

*Note.*—Station established May 28, 1915, by W. H. Storey.

## DISCHARGE MEASUREMENTS of Etzikom Coulee near Goddard, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 29.....	G. H. Whyte and W. H. Storey.				0.53	0.514a
July 20.....	W. H. Storey.	4.9	3.80	1.14	1.22	4.300
Aug. 6.....	do	15.5	14.85	0.36	1.28	5.300
Sept. 14.....	do	5.3	3.36	1.30	1.11	4.400
Oct. 3.....	do	6.5	3.80	1.39	1.11	5.300

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Etzikom Coulee near Goddard, for 1915.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.59	0.51	0.50	0.30	1.35	6.2	1.02	3.1	1.06	4.5
2.....			0.75	1.02	0.49	0.28	1.34	6.1	1.02	3.1	1.14	5.6
3.....			0.80	1.21	0.45	0.21	1.34	6.1	1.02	3.1	1.11	5.2
4.....			0.65	0.68	0.45	0.21	1.32	5.8	1.01	3.1	1.11	5.2
5.....			0.75	1.02	0.50	0.30	1.30	5.5	1.00	3.0	1.12	5.3
6.....			0.61	0.56	0.60	0.53	1.28	5.2	1.00	3.0	1.11	5.2
7.....			0.61	0.56	0.70	0.82	1.25	4.9	1.00	3.1	1.10	5.0
8.....			0.62	0.59	0.80	1.21	1.25	4.9	1.02	3.3	1.10	5.0
9.....			0.64	0.65	0.90	1.70	1.25	4.9	1.05	3.6	1.10	5.0
10.....			0.55	0.42	1.05	2.70	1.24	4.9	1.05	3.6	1.15	5.8
11.....			0.54	0.39	1.05	2.70	1.24	4.9	1.05	3.7	1.20	6.6
12.....			0.54	0.39	1.00	2.30	1.23	4.8	1.07	3.9	1.19	6.4
13.....			0.54	0.39	1.00	2.30	1.21	4.5	1.09	4.1	1.15	5.8
14.....			0.54	0.39	1.05	2.70	1.20	4.5	1.11	4.4	1.14	5.6
15.....			0.60	0.53	1.05	2.70	1.20	4.5	1.05	3.8	1.12	5.3
16.....			0.55	0.42	1.09	3.00	1.19	4.4	1.06	3.9	1.13	5.5
17.....			0.74	0.98	1.14	3.50	1.20	4.7	1.06	3.9	1.15	5.8
18.....			0.50	0.30	1.20	4.10	1.19	4.5	1.05	3.9	1.15	5.8
19.....			0.60	0.53	1.20	4.10	1.18	4.4	1.06	4.0	1.10	5.0
20.....			0.62	0.59	1.22	4.40	1.15	4.0	1.05	3.9	1.10	5.0
21.....			0.56	0.44	1.22	4.40	1.15	4.1	1.05	4.0	1.09	4.9
22.....			0.56	0.44	1.23	4.50	1.16	4.2	1.05	4.0	1.09	4.9
23.....			0.54	0.39	1.24	4.70	1.15	4.1	1.06	4.1	1.09	4.9
24.....			0.50	0.30	1.25	4.80	1.14	4.1	1.10	4.8	1.10	5.0
25.....			0.56	0.44	1.25	4.80	1.12	3.9	1.05	4.1	1.12	5.3
26.....			0.55	0.42	1.25	4.80	1.10	3.7	1.01	4.7	1.25	7.4
27.....			0.54	0.39	1.25	4.80	1.09	3.6	1.05	4.2	1.10	5.0
28.....	0.54	0.39	0.54	0.39	1.28	5.20	1.08	3.6	1.05	4.2	1.10	5.0
29.....	0.56	0.44	0.54	0.39	1.40	7.00	1.05	3.3	1.05	4.2	1.10	5.0
30.....	0.47	0.25	0.52	0.35	1.40	7.00	1.04	3.2	1.04	4.2	1.25	7.4
31.....	0.48	0.26			1.39	6.80	1.02	3.1			1.26	7.6



## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Etzikom Coulee near Goddard, for 1915.

(Drainage area 714 square miles.)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
May (28-31).....	0.44	0.25	0.33	0.0005	0.0007	3
June.....	1.21	0.30	0.54	0.0008	0.0009	32
July.....	7.00	0.21	3.20	0.0045	0.0052	197
August.....	6.20	3.10	4.50	0.0063	0.0073	277
September.....	4.80	3.00	3.80	0.0053	0.0059	226
October.....	7.60	4.50	5.50	0.0077	0.0089	338
The period.....					0.0289	1,073

## MANYBERRIES CREEK AT HOOPER AND HUCKVALE RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 27, Tp. 4, Rge. 6, W. 4th Mer.*Records available.*—April 1, 1911, to October 31, 1915.*Gauge.*—Vertical staff. Zero maintained at elevation 87.00 feet since establishment.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Channel.*—The stream flows in one channel except in very high stages; bed consists of sand, clay and gravel.*Discharge measurements.*—At low stages made by wading, at high stages a portable cable and cable car is used.*Diversions.*—Hooper and Huckvale's north ditch diverts water about one-half mile above this station and the south ditch about one-half mile below.*Observer.*—Sidney Hooper.

## DISCHARGE MEASUREMENTS of Manyberries Creek at Hooper and Huckvale Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19.....	W. H. Storey	3.5	0.48	0.20	2.20	0.09
May 7.....	do				2.18	0.57 <sup>a</sup>
May 17.....	do				2.18	0.08 <sup>a</sup>
June 4.....	do	10.0	2.80	1.33	2.51	3.73
June 7.....	C. S. Rickards					Nil.
June 10.....	W. H. Storey					"
June 29.....	do					<sup>b</sup>
July 27.....	do					Nil.
Aug. 13.....	do					"
Aug. 31.....	do					"
Sept. 21.....	do				2.04	0.03 <sup>a</sup>
Oct. 9.....	do					<sup>b</sup>
Oct. 23.....	do					<sup>b</sup>

<sup>a</sup> Weir measurements.<sup>b</sup> Small trickle, too small to measure.

## DAILY GAUGE HEIGHT AND DISCHARGE of Manyberries Creek at Hooper and Huckvale Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			4.51	67.00	Dry.	Nil.	Dry.	Nil.
2.....			5.85	112.00	"	"	"	"
3.....			8.70	209.00	"	"	3.20	22.00
4.....			3.91	46.00	"	"	2.52	4.30
5.....			4.72	74.00	"	"	2.35	2.10
6.....			4.37	62.00	"	"	2.19	0.89
7.....			3.66	38.00	"	"	Dry.	Nil.
8.....			3.24	23.00	"	"	"	"
9.....			3.06	17.30	"	"	"	"
10.....			2.96	14.20	"	"	"	"
11.....			2.58	5.40	"	"	"	"
12.....			2.33	1.90	"	"	"	"
13.....			2.09	0.37	"	"	"	"
14.....			2.01	0.13	"	"	"	"
15.....			Dry.	Nil.	"	"	"	"
16.....			"	"	"	"	"	"
17.....			"	"	"	"	"	"
18.....			"	"	"	"	"	"
19.....			"	"	"	"	"	"
20.....			"	"	"	"	2.13	0.56
21.....			"	"	"	"	"	"
22.....	4.88	79	"	"	"	"	2.20	0.95
23.....	5.36	95	"	"	"	"	2.21	1.02
24.....	6.56	136	"	"	"	"	Dry.	Nil.
25.....	11.40	301	"	"	"	"	"	"
26.....	8.20	192	"	"	"	"	"	"
27.....	6.40	131	"	"	"	"	2.81	10.20
28.....	3.48	31	"	"	"	"	Dry.	Nil.
29.....	4.88	79	"	"	"	"	"	"
30.....	4.46	65	"	"	"	"	"	"
31.....	4.44	64	"	"	"	"	"	"

## SESSIONAL PAPER NO. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Manyberries Creek at Hooper and Huckvale Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	Dry.	Nil.	Dry.	Nil.	Dry.	Nil.	Dry.	Nil.
2.....	"	"	"	"	"	"	"	"
3.....	"	"	"	"	"	"	"	"
4.....	"	"	"	"	"	"	"	"
5.....	"	"	"	"	"	"	"	"
6.....	"	"	"	"	"	"	"	"
7.....	"	"	"	"	"	"	"	"
8.....	"	"	"	"	"	"	"	"
9.....	"	"	"	"	"	"	"	"
10.....	"	"	"	"	"	"	"	"
11.....	"	"	"	"	"	"	"	"
12.....	"	"	"	"	"	"	"	"
13.....	2.25	1.27	"	"	"	"	"	"
14.....	6.84	146.00	"	"	"	"	"	"
15.....	3.93	47.00	"	"	"	"	"	"
16.....	2.80	10.00	"	"	"	"	"	"
17.....	2.16	0.73	"	"	"	"	"	"
18.....	2.43	3.00	2.45	3.20	"	"	"	"
19.....	2.24	1.21	3.05	17.00	"	"	"	"
20.....	1.95	0.05	4.48	66.00	"	"	"	"
21.....	Dry.	Nil.	3.54	34.00	"	"	"	"
22.....	"	"	2.94	13.60	"	"	"	"
23.....	"	"	2.06	0.28	"	"	"	"
24.....	"	"	Dry.	Nil.	"	"	"	"
25.....	"	"	"	"	"	"	"	"
26.....	"	"	"	"	"	"	"	"
27.....	"	"	"	"	"	"	"	"
28.....	"	"	"	"	"	"	"	"
29.....	"	"	"	"	"	"	"	"
30.....	3.55	34.00	"	"	"	"	"	"
31.....	2.22	1.08	"	"	"	"	"	"

## MONTHLY DISCHARGE of Manyberries Creek at Hooper and Huckvale Ranch, for 1915.

(Drainage area 142 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	301	31	117.00	0.824	0.31	2,321
April.....	209	Nil.	22.00	0.155	0.17	1,309
May.....	22	Nil.	1.40	0.010	0.01	Nil.
June.....	146	"	7.90	0.056	0.06	83
July.....	66	"	4.30	0.030	0.03	486
August.....						264
September.....						Nil.
October.....						Nil.
The period.....					0.58	4,463

## HOOPER AND HUCKVALE NORTH DITCH FROM MANYBERRIES CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 27, Tp. 4, Rge. 6, W. 4th Mer.

*Records available.*—From May 2, 1912, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 93.35 feet, since establishment

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made by wading.

*Observer.*—Sidney Hooper.

## DISCHARGE MEASUREMENTS of Hooper and Huckvale North Ditch from Manyberries Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19.....	W. H. Storey.....	9.7	3.17	1.21	2.17	3.82
May 7.....	do.....				1.72	0.49 <sub>a</sub>
May 17.....	do.....	8.5	2.82	0.90	2.02	2.53
June 4.....	do.....	14.0	12.60	1.14	2.57	14.42
June 7.....	C. S. Rickards.....	9.7	3.96	1.09	2.15	4.32
June 10.....	W. H. Storey.....				1.78	0.92 <sub>a</sub>
June 29.....	do.....	5.0	2.10	0.72	1.92	1.52
July 27.....	do.....	3.0	0.73	0.58	1.67	0.42
Aug. 13.....	do.....				Dry.	Nil.
Aug. 31.....	do.....				1.43	0.06 <sub>a</sub>
Sept. 21.....	do.....	6.0	0.90	0.37	1.65	0.33
Oct. 9.....	do.....				Dry.	Nil.
Oct. 23.....	do.....					

*a* Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Hooper and Huckvale North Ditch from Manyberries Creek, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.68	18.20	1.83	1.03	1.52	0.12
2.....			3.56	59.00	1.81	0.91	1.62	0.24
3.....			3.84	73.00	1.79	0.80	2.57	14.10
4.....			2.91	27.00	1.76	0.67	2.58	14.40
5.....			2.72	19.80	1.76	0.67	2.46	11.00
6.....			2.83	24.00	1.72	0.49	2.15	4.30
7.....			2.73	20.00	1.71	0.44	2.62	15.80
8.....			2.65	17.00	1.73	0.54	1.93	1.72
9.....			2.66	17.40	1.68	0.36	1.86	1.21
10.....			2.62	15.80	1.68	0.36	1.78	0.76
11.....			2.54	13.20	1.67	0.34	1.75	0.62
12.....			2.49	11.80	1.66	0.32	1.71	0.44
13.....			2.52	12.60	1.62	0.24	1.67	0.34
14.....			2.52	12.60	1.62	0.24	1.73	0.54
15.....			2.46	11.00	1.79	0.80	1.68	0.36
16.....			2.35	8.20	1.87	1.27	1.77	0.72
17.....			2.31	7.20	1.83	1.03	1.75	0.62
18.....			2.22	5.40	2.01	2.50	1.70	0.40
19.....			2.16	4.40	1.88	1.33	1.68	0.36
20.....			2.12	3.80	1.84	1.09	2.01	2.50
21.....			2.07	3.20	1.81	0.91	2.43	10.20
22.....	2.29	6.8	2.02	2.60	1.79	0.80	2.46	11.00
23.....	2.51	12.3	2.00	2.40	1.70	0.40	2.16	4.40
24.....	3.20	41.0	1.97	2.10	1.64	0.28	1.87	1.27
25.....	2.54	13.2	1.94	1.81	1.63	0.26	1.84	1.09
26.....	2.26	6.2	1.92	1.63	1.62	0.24	1.91	1.54
27.....	2.38	9.0	1.92	1.63	1.60	0.20	2.38	9.00
28.....	2.46	11.0	1.92	1.63	1.58	0.18	2.16	4.40
29.....	2.80	23.0	1.90	1.45	1.56	0.16	1.92	1.63
30.....	2.91	27.0	1.87	1.27	1.34	0.14	1.83	1.03
31.....	2.98	30.0			1.52	0.12		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Hooper and Huckvale North Ditch from Manyberries Creek, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.74	0.58	2.20	5.00	Dry.	Nil.	Dry.	Nil.
2.....	1.69	0.38	2.01	2.50	"	"	"	"
3.....	1.65	0.30	1.86	1.21	"	"	"	"
4.....	1.65	0.30	1.79	0.80	"	"	"	"
5.....	1.73	0.54	1.74	0.58	2.46	11.00	"	"
6.....	1.80	0.85	1.65	0.30	2.12	3.80	"	"
7.....	1.76	0.67	1.61	0.22	1.91	1.54	"	"
8.....	1.52	0.12	1.52	0.12	1.83	1.03	"	"
9.....	1.54	0.14	1.45	0.05	1.78	0.76	"	"
10.....	1.57	0.17	Dry.	Nil.	1.71	0.44	"	"
11.....	1.51	0.11	"	"	1.63	0.26	"	"
12.....	1.46	0.06	"	"	1.61	0.22	"	"
13.....	1.84	1.09	"	"	1.61	0.22	"	"
14.....	3.30	46.00	"	"	1.66	0.32	"	"
15.....	2.50	12.00	"	"	2.13	4.00	"	"
16.....	2.00	2.40	"	"	2.06	3.10	"	"
17.....	2.34	8.00	2.04	2.80	1.89	1.39	"	"
18.....	2.34	8.00	2.41	9.80	1.83	1.03	"	"
19.....	2.39	9.20	2.09	3.40	1.80	0.85	"	"
20.....	2.14	4.10	1.97	2.10	1.72	0.49	"	"
21.....	2.08	3.30	1.95	1.90	1.65	0.30	"	"
22.....	1.91	1.54	1.75	0.62	1.61	0.22	"	"
23.....	1.82	0.97	1.71	0.44	1.58	0.18	"	"
24.....	1.76	0.67	1.70	0.40	1.57	0.17	"	"
25.....	1.72	0.49	1.68	0.36	1.53	0.13	"	"
26.....	1.63	0.26	1.68	0.36	Dry.	Nil.	"	"
27.....	1.71	0.44	1.66	0.32	"	"	"	"
28.....	1.81	0.91	1.62	0.24	"	"	"	"
29.....	1.78	0.76	1.57	0.17	"	"	"	"
30.....	2.23	5.60	1.52	0.12	"	"	"	"
31.....	2.47	11.20	1.46	0.06	"	"	"	"

MONTHLY DISCHARGE of Hooper and Huckvale North Ditch from Manyberries Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-Feet			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
March (22-31).....	41 0	6 20	18 00	74
April.....	73 0	1 27	13 40	101
May.....	2 5	0 12	0 62	8
June.....	15 8	0 12	5 50	242
July.....	46 0	0 06	3 90	240
August.....	9 8	0 05	1 10	68
September.....	11 0	Nil.	1 01	61
October.....				Nil.
The period.....				1,472

## HOOPER AND HUCKVALE SOUTH DITCH FROM MANYBERRIES CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 22, Tp. 4, Rge. 6, W. 4th Mer.*Records available.*—March 31, 1914, to October 31, 1915.*Gauge.*—Vertical staff. Zero elevation maintained at 93.07 feet, since establishment.*Bench-mark.*—4' x 4' post in headgate of ditch. Assumed elevation, 100.00 feet.*Discharge measurements.*—Made by wading.*Observer.*—Sidney Hooper.

## DISCHARGE MEASUREMENTS of Hooper and Huckvale South Ditch from Manyberries Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 19.....	W. H. Storey.....				Dry.	Nil.
May 7.....	do.....					
June 4.....	do.....	6.0	2.10	0.72	1.64	1.51
June 7.....	C. S. Rickards.....				Dry.	Nil.
June 10.....	W. H. Storey.....					
June 29.....	do.....				"	"
July 27.....	do.....				"	"
Aug. 13.....	do.....				"	"
Aug. 31.....	do.....				"	"
Sept. 21.....	do.....				"	"
Oct. 9.....	do.....				"	"
Oct. 23.....	do.....				"	"

## DAILY GAUGE HEIGHT AND DISCHARGE of Hooper and Huckvale South Ditch from Manyberries Creek, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			Dry.	Nil.	Dry.	Nil.	Dry.	Nil.
2.....			4.23	36.00	"	"	"	"
3.....			4.43	39.00	"	"	"	"
4.....			4.63	42.00	"	"	1.65	1.65
5.....			3.54	26.00	"	"	1.30	0.35
6.....			2.33	9.40	"	"	Dry.	Nil.
7.....			1.69	1.93	"	"	"	"
8.....			1.53	0.99	"	"	"	"
9.....			1.30	0.35	"	"	"	"
10.....			Dry.	Nil.	"	"	"	"
11.....			"	"	"	"	"	"
12.....			"	"	"	"	"	"
13.....			"	"	"	"	"	"
14.....			"	"	"	"	"	"
15.....			"	"	"	"	"	"
16.....			"	"	"	"	"	"
17.....			"	"	"	"	"	"
18.....			"	"	"	"	"	"
19.....			"	"	"	"	"	"
20.....			"	"	"	"	1.19	0.19
21.....	Dry.	Nil.	"	"	"	"	1.24	0.26
22.....	"	"	"	"	"	"	1.25	0.28
23.....	"	"	"	"	"	"	Dry.	Nil.
24.....	"	"	"	"	"	"	"	"
25.....	"	"	"	"	"	"	"	"
26.....	"	"	"	"	"	"	"	"
27.....	"	"	"	"	"	"	1.86	3.50
28.....	"	"	"	"	"	"	Dry.	Nil.
29.....	"	"	"	"	"	"	"	"
30.....	"	"	"	"	"	"	"	"
31.....	"	"	"	"	"	"	"	"

## SESSIONAL PAPER No. 25

DAILY GAUGE HEIGHT AND DISCHARGE of Hooper and Huckvale South Ditch from Manyberries Creek, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	Dry.	Nil.	Dry.	Nil.	Dry.	Nil.	Dry.	Nil.
2.....	"	"	"	"	"	"	"	"
3.....	"	"	"	"	"	"	"	"
4.....	"	"	"	"	"	"	"	"
5.....	"	"	"	"	"	"	"	"
6.....	"	"	"	"	"	"	"	"
7.....	"	"	"	"	"	"	"	"
8.....	"	"	"	"	"	"	"	"
9.....	"	"	"	"	"	"	"	"
10.....	"	"	"	"	"	"	"	"
11.....	"	"	"	"	"	"	"	"
12.....	"	"	"	"	"	"	"	"
13.....	1.10	0.10	"	"	"	"	"	"
14.....	2.99	18.70	"	"	"	"	"	"
15.....	2.10	6.30	"	"	"	"	"	"
16.....	1.76	2.50	"	"	"	"	"	"
17.....	Dry.	Nil.	"	"	"	"	"	"
18.....	"	"	"	"	"	"	"	"
19.....	"	"	"	"	"	"	"	"
20.....	"	"	3.55	26.0	"	"	"	"
21.....	"	"	3.04	19.4	"	"	"	"
22.....	"	"	2.33	9.4	"	"	"	"
23.....	"	"	1.74	2.4	"	"	"	"
24.....	"	"	Dry.	Nil.	"	"	"	"
25.....	"	"	"	"	"	"	"	"
26.....	"	"	"	"	"	"	"	"
27.....	"	"	"	"	"	"	"	"
28.....	"	"	"	"	"	"	"	"
29.....	"	"	"	"	"	"	"	"
30.....	"	"	"	"	"	"	"	"
31.....	"	"	"	"	"	"	"	"

MONTHLY DISCHARGE of Hooper and Huckvale South Ditch from Manyberries Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet
	Maximum.	Minimum.	Mean.	
March (21-30) ..				Nil.
April.....	42.0	Nil.	5.20	Nil.
May.....				Nil.
June.....	3.5	Nil.	0.21	12
July.....	18.7	Nil.	0.98	34
August.....	26.0	Nil.	1.84	11
September.....				Nil.
October.....				Nil.
The period				489

## KETCHUM CREEK AT PICKETT'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 25, Tp. 4, Rge. 7, W. 4th Mer.

*Records available.*—May 17, 1915, to October 31, 1915.

*Gauge.*—Vertical staff, Zero elevation, maintained at 93.985 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made by wading; none were obtained during 1915.

*Observer.*—C. J. Pickett.

*Remarks.*—Station established May 17, 1915, by W. H. Storey.



DISCHARGE MEASUREMENTS of Ketchum Creek at Pickett's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 10.....	W. H. Storey.....				Dry.	Nil.
June 30.....	do.....				"	"
July 7.....	do.....				"	"
July 28.....	do.....				1.40	..... <sup>a</sup>
Aug. 16.....	do.....				Dry.	Nil.
Sept. 1.....	do.....				"	"
Sept. 22.....	do.....				"	"
Oct. 11.....	do.....				"	"
Oct. 23.....	do.....				"	"

<sup>a</sup> Small trickle, too small to measure.

DAILY GAUGE HEIGHT of Ketchum Creek at Pickett's Ranch, for 1915.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			Dry.		Dry.		Dry.		Dry.		Dry.	
2.....			"		"		"		"		"	
3.....			"		"		"		"		"	
4.....			"		"		"		"		"	
5.....			"		"		"		"		"	
6.....			"		"		"		"		"	
7.....			"		"		"		"		"	
8.....			"		"		"		"		"	
9.....			"		"		"		"		"	
10.....			"		"		"		"		"	
11.....			"		"		"		"		"	
12.....			"		"		"		"		"	
13.....			"		"		"		"		"	
14.....			"		2.25		"		"		"	
15.....			"		5.05		"		"		"	
16.....			"		4.62		"		"		"	
17.....	Dry.		"		3.90		"		"		"	
18.....	1.44		"		3.28		"		"		"	
19.....	1.35		"		3.55		2.55		"		"	
20.....	1.35		"		2.44		4.32		"		"	
21.....	Dry.		"		2.15		2.82		"		"	
22.....	"		"		1.90		3.50		"		"	
23.....	"		"		1.80		2.90		"		"	
24.....	"		"		1.60		2.40		"		"	
25.....	"		"		1.58		1.90		"		"	
26.....	"		"		1.50		1.72		"		"	
27.....	"		"		1.43		1.65		"		"	
28.....	"		"		1.40		1.62		"		"	
29.....	"		"		Dry.		1.51		"		"	
30.....	"		"		"		1.45		"		"	
31.....	"		"		"		1.40		"		"	

NOTE.—No discharge measurements were obtained on this stream, and an estimate of the discharge was not attempted.

## SESSIONAL PAPER No. 25c

MISCELLANEOUS DISCHARGE MEASUREMENTS in Pakowki Lake drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
April 19.....	W. H. Storey.....	Canal Creek.....	Sec. 6-4-6-4.....				Nil.
May 7.....	do.....	do.....	Sec. 27-3-6-4.....				3 750
May 18.....	do.....	do.....	Sec. 6-4-6-4.....	6.0	5.00	0.76	3 170
June 10.....	do.....	do.....	do.....	5.0	4.80	0.65	3 170
June 11.....	do.....	do.....	Sec. 27-3-6-4.....	4.5	1.62	0.50	0 810
June 29.....	do.....	do.....	do.....				0 195a
July 2.....	do.....	do.....	Sec. 6-4-6-4.....	6.0	2.50	0.74	1 840
July 7.....	do.....	do.....	do.....	6.0	2.30	0.54	1 230
July 10.....	do.....	do.....	do.....	7.0	4.50	0.87	3 990
July 27.....	do.....	do.....	Sec. 27-3-6-4.....				Nil.
July 28.....	do.....	do.....	Sec. 6-4-6-4.....				"
Aug. 13.....	do.....	do.....	Sec. 27-3-6-4.....				"
Aug. 16.....	do.....	do.....	Sec. 6-4-6-4.....				"
Aug. 31.....	do.....	do.....	Sec. 27-3-6-4.....				"
Sept. 1.....	do.....	do.....	Sec. 6-4-6-4.....				"
Sept. 21.....	do.....	do.....	Sec. 27-3-6-4.....				0 148a
Sept. 22.....	do.....	do.....	Sec. 6-4-6-4.....				Nil.
Oct. 9.....	do.....	do.....	Sec. 27-3-6-4.....				0 148a
Oct. 11.....	do.....	do.....	Sec. 6-4-6-4.....				0 171a
Oct. 23.....	do.....	do.....	do.....				Nil.
Oct. 26.....	do.....	do.....	Sec. 27-3-6-4.....				"
June 29.....	do.....	Dead Creek.....	SW. 22-4-6-4.....				"
July 27.....	do.....	do.....	do.....				"
Aug. 13.....	do.....	do.....	do.....				"
Aug. 31.....	do.....	do.....	do.....				"
Sept. 21.....	do.....	do.....	do.....				0 026a
Oct. 9.....	do.....	do.....	do.....				Nil.
Oct. 26.....	do.....	do.....	do.....				"
June 9.....	do.....	Irrigation Creek.....	Sec. 7-6-5-4.....				"
April 19.....	do.....	Ketchum Creek (North Br.).....	Sec. 16-4-6-4.....				"
May 7.....	do.....	do.....	do.....				"
May 18.....	do.....	do.....	do.....				"
June 11.....	do.....	do.....	do.....				"
June 29.....	do.....	do.....	do.....				0 266a
July 27.....	do.....	do.....	do.....				Nil.
Aug. 13.....	do.....	do.....	do.....				"
Aug. 31.....	do.....	do.....	do.....				"
Sept. 21.....	do.....	do.....	do.....				0 003a
Oct. 9.....	do.....	do.....	do.....				Nil.
Oct. 26.....	do.....	do.....	do.....				"
July 27.....	do.....	do.....	do.....				"
Aug. 13.....	do.....	(South Br.).....	Sec. 10-4-5-4.....				"
Aug. 31.....	do.....	do.....	do.....				"
Sept. 21.....	do.....	do.....	do.....				"
Oct. 9.....	do.....	do.....	do.....				"
Oct. 26.....	do.....	do.....	do.....				"
July 3.....	do.....	Ketchum Creek.....	Sec. 35-4-7-4.....				"
July 28.....	do.....	do.....	do.....				"
Aug. 14.....	do.....	do.....	do.....				"
May 17.....	do.....	Manyberries Creek.....	Sec. 3-5-7-4.....				"
June 10.....	do.....	do.....	do.....				"
July 3.....	do.....	do.....	do.....				"
July 28.....	do.....	do.....	do.....				"
Aug. 14.....	do.....	do.....	do.....				"
Oct. 11.....	do.....	do.....	Sec. 31-4-6-4.....	5.0	1.00	0.30	0 150
June 9.....	do.....	do.....	do.....				"
		(North Br.).....	SE. 24-5-6-4.....				"

a Weir measurement.

b Small trickle, too small to measure.

## SAGE CREEK DRAINAGE BASIN.

*General Description.*

Sage Creek is a small and unimportant stream which rises in Township 5, Range 4, West of the 4th Meridian, and flows southerly, crossing the international boundary in Range 2.

The stream has no definite or permanent source of supply, and derives its discharge principally from the melting snow, which accumulates in numerous coulees during the winter months. The period of flow, therefore, is in general confined to the spring months, while the melting snow is passing off. Very heavy rains sometimes cause a flow, but the drainage area being absolutely devoid of tree growth the run-off is very rapid.

After entering the United States, Sage Creek spreads out over a large dry lake, which has no outlet. This lake is about ten miles long and averages one and one-half miles in width, and lies close to the boundary. The lake is bounded on the south by a low range of hills, and at some time has held two or three feet of water at its deepest parts. Since 1908 there has been no water in the lake.

## SAGE CREEK AT WILD HORSE POLICE DETACHMENT.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 9, Tp. 1, Rge. 2, W. 4th Mer., near Wild Horse Police Detachment.

*Records available.*—Estimated discharge records for 1910–13, based on discharge measurements made in 1915, are given herewith and supersede those published in the 1914 report.

*Gauge.*—Vertical staff. Zero of gauge maintained at 93.36 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made by wading or with a weir.

*Channel.*—Composed of hard clay and well grassed over. Practically permanent.

*Observer.*—No records of gauge heights were obtained in 1915 although there was flow for about two weeks in the fall.

*Accuracy.*—The estimates given herewith are not considered absolutely correct but are compiled from the best available data.

## DISCHARGE MEASUREMENTS of Sage Creek at Wild Horse Police Detachment, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 12.....	H. W. Rowley.....				1.62	Nil.
Aug. 17.....	H. R. Carscallen.....	13.0	50	0.99	4.78	50.00
Aug. 18.....	do.....	14.8	55	0.96	5.50	53.00
Sept. 1.....	H. W. Rowley.....				2.21	0.91a

a Weir measurement.

## ANNUAL DISCHARGE of Sage Creek at Wild Horse Police Detachment, for 1910–13.

YEAR.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Total in Acre-feet.	Corrected total in Acre-feet. <sup>a</sup>
1910.....	31.5	0.05	12.97	360	.....
1911.....	77.9	0.00	7.31	914	1,674
1912.....	84.8	0.00	17.24	2,086	2,926
1913.....	60.2	0.00	13.51	1,501	1,951

<sup>a</sup> The creek above the station has built up a channel above the flats on each side, and some of the flood flow finds its way onto these flats. The corrected total run-off provides for this loss which has been estimated by H. R. Carscallen, Irrigation Inspector, as 160 acre-feet, in 1911, 840 acre-feet, in 1912 and 450 acre-feet in 1913.



Sage Creek in flood at "Q" Ranch, on August 17, 1915. Note the natural irrigation of the hay meadows. Taken by H. R. Carscallen.



Sage Creek in flood at Wild Horse Police Detachment, on August 18, 1915. Taken by H. R. Carscallen.



LODGE CREEK DRAINAGE BASIN.

*General Description.*

Lodge Creek, which rises in Township 7, Range 3, West of the 4th Meridian, flows in a southerly direction for about twelve miles, then turns southeastward, crosses the international boundary at Section 4, Township 1, Range 28, West of the 3rd Meridian, and eventually empties into Milk River at Chinook, Montana. Its principal tributary is Middle Creek, which joins it in Section 4, Township 2, Range 29, West of the 3rd Meridian.

Near its head the valley is very deep and narrow but it broadens out considerably lower down, giving rise to large flats and meadows. The upper part of the drainage basin is cut up to a great extent by deep coulees which drain into the creek. This part of the creek is thickly covered with brush along the banks, but lower down it is totally devoid of tree growth. The valley is rather unproductive owing to the absence of moisture but a few good hay meadows have been developed along its course through the storage of the flood waters and their application to the soil by irrigation. As is the case with many of the streams in this locality the flow in Lodge Creek is not continuous throughout the year, the creek being dry, with the exception of pools of standing water, during the greater part of the summer months. At flood stages the creek carries a considerable amount of water and as a result its channel is wide and well defined throughout the whole length of its course.

The station at Willow Creek Police Detachment was the only station on the main stream maintained for the full season of 1915.

The station at Hester's ranch was discontinued at the beginning of the season, and the station at Hartt's ranch was discontinued on June 8, 1915. Descriptions of these stations and others maintained in the Lodge Creek drainage area are given below.

HANCKEL DITCH NEAR EAGLE BUTTE.

*Location.*—About three-quarters of a mile downstream from intake of ditch. On NE.  $\frac{1}{4}$  Sec. 30, Tp. 7, Rge. 3, W. 4th Mer.

*Gauge.*—Vertical staff driven into the bed of the stream near the right bank. The zero of the gauge was established and maintained at 98.38 feet.

*Bench-mark.*—Permanent iron bench-mark near the gauge on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Miss Hanckel.

*Remarks.*—This station was established by H. R. Carscallen, October 4, 1915. No records available for 1915.

H. A. MUDIE DITCH FROM SEXTON CREEK.

*Location.*—On the NW  $\frac{1}{4}$  Sec. 21, Tp. 7, Rge. 3, W. 4th Mer., about one-quarter of a mile downstream from intake of ditch.

*Gauge.*—Vertical staff driven into the bed of the ditch near the right bank. The elevation of zero of gauge maintained at 97.16 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark located near the gauge on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with current meter or with weir.

*Observer.*—H. A. Mudie.

*Remarks.*—This station was established September 28, 1915, by H. R. Carscallen. No records available for 1915.

M. T. CLARK NORTH DITCH FROM SEXTON CREEK.

*Location.*—On the SW  $\frac{1}{4}$  Sec. 21, Tp. 7, Rge. 3, W. 4th Mer., 430 feet below headgate of irrigation ditch.

*Gauge.*—Vertical staff driven into the bed of the ditch. Elevation of zero maintained at 97.61 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark located on the right bank near the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand loam.

*Discharge measurements.*—Made with weir or meter.

*Observer.*—M. T. Clark.

*Remarks.*—Station established September 28, 1915, by H. R. Carscallen. No records available for 1915.

## M. T. CLARK SOUTH DITCH FROM SEXTON CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 21, Tp. 7, Rge. 3, W. 4th Mer., 140 feet below intake of ditch.

*Gauge.*—Vertical staff driven into the bed of the ditch near the left bank. Elevation of zero of gauge maintained at 95.32 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark, located at the north ditch station. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand loam.

*Discharge measurements.*—Made with a weir or meter.

*Observer.*—M. T. Clark.

*Remarks.*—This station was established by H. R. Carscallen, September 28, 1915. No records available for 1915.

## JOHN READ DITCH FROM MICHEL COULEE.

*Location.*—On the NE  $\frac{1}{4}$  Sec. 33, Tp. 6, Rge. 3, W. 4th Mer., 90 feet below point of ditch from Michel Coulee.

*Gauge.*—Vertical staff gauge driven in the bed of the ditch near the left bank. Elevation of zero maintained at 95.45 feet since establishment.

*Bench-mark.*—Top of iron post located near the gauge on the left bank of ditch. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with a current meter or with a weir.

*Observer.*—John Read.

*Remarks.*—This station was established by H. R. Carscallen September 28, 1915. No records available for 1915.

## JOHN READ DITCH FROM READ CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 34, Tp. 6, Rge. 3, W. 4th Mer., 300 feet downstream from intake of ditch.

*Gauge.*—Vertical staff, driven into bed of stream near right bank. Zero of gauge maintained at 97.30 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark near the gauge on the left bank of ditch. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand loam.

*Discharge measurements.*—Made with current meter or with a weir.

*Observer.*—John Reid.

*Remarks.*—Station established September 27, 1915, by H. R. Carscallen. No records available for 1915.

## ENGLISH DITCH FROM EAST BRANCH OF LODGE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 12, Tp. 7, Rge. 3, W. 4th Mer., 360 feet above two-way gate where first lateral is taken out of main ditch.

*Gauge.*—Vertical staff driven into bed of the stream near the left bank. Elevation of zero of gauge maintained at 97.69 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark, located in the left bank near the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gravel and loam.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—James English.

*Remarks.*—This station was established September 29, 1915, by H. R. Carscallen too late to obtain any records for the irrigation season of 1915.

## EAST BRANCH OF LODGE CREEK AT ENGLISH'S RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 1, Tp. 7, Rge. 3, W. 4th Mer., at James English's ranch.

*Records available.*—October 7, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation of gauge maintained at 95.38 feet during 1911. Zero elevation of gauge maintained at 95.43 feet during 1912. Zero elevation of gauge maintained at 95.35 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Not likely to shift except during floods.

*Discharge measurements.*—Made by wading or with weir.

*Winter flow.*—Station discontinued during winter season.

*Control.*—On August 19 an artificial log control was installed at this station.

*Diversions.*—Water is diverted for irrigation, about three miles above this station, by James English.



SESSIONAL PAPER No. 25c

DISCHARGE MEASUREMENTS of East Branch of Lodge Creek at English's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 11.....	H. W. Rowley.....	a			0.98	0.17
June 8.....	do.....				1.20	2.30
June 9.....	do.....	a			1.14	1.59
Aug. 19.....	do.....				0.89	Nil.
Sept. 13.....	do.....				Dry.	
Oct. 7.....	do.....				"	
Oct. 30.....	do.....	a			0.93	0.17

a Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of East Branch of Lodge Creek at English's Ranch, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.35	4.50	0.93	0.08	1.00	0.28
2.....	1.65	9.00	0.95	0.08	1.17	1.94
3.....	3.32	34.00	0.95	0.08	1.38	4.90
4.....	2.98	29.00	0.95	0.08	2.78	26.00
5.....	2.12	16.00	0.95	0.08	2.67	24.00
6.....	1.75	10.50	0.90	0.00	2.65	24.00
7.....	1.55	7.50	0.90	0.00	2.12	16.00
8.....	1.40	5.20	0.90	0.00	1.35	4.50
9.....	1.35	4.50	0.90	0.00	1.14	1.58
10.....	1.35	4.50	0.90	0.00	1.20	2.30
11.....	1.25	3.00	0.90	0.00	1.20	2.30
12.....	1.30	3.70	0.90	0.00	1.20	2.30
13.....	1.25	3.00	1.12	1.35	1.15	1.70
14.....	1.25	3.00	1.16	1.82	1.10	1.13
15.....	1.25	3.00	1.42	5.50	1.05	0.65
16.....	1.30	3.70	1.42	5.50	1.05	0.65
17.....	1.32	4.00	1.48	6.40	1.00	0.28
18.....	1.25	3.00	1.40	5.20	1.00	0.28
19.....	1.22	2.60	1.35	4.50	1.00	0.28
20.....	1.20	2.30	1.30	3.70	0.95	0.08
21.....	1.25	3.00	1.19	2.20	0.95	0.08
22.....	1.25	3.00	1.15a	1.70	0.95	0.08
23.....	1.25	3.00	1.10	1.13	0.95	0.08
24.....	1.20	2.30	1.20	2.30	1.00	0.28
25.....	1.20	2.30	1.18	2.10	1.05	0.65
26.....	1.15	1.70	1.05	0.65	1.05	0.65
27.....	1.15	1.70	1.00	0.28	1.15	1.70
28.....	1.10	1.13	0.95	0.08	1.10	1.13
29.....	1.05	0.65	0.95	0.08	1.00	0.28
30.....	1.00	0.28	0.95	0.08	1.00	0.28
31.....			0.98	0.18		

a Gauge height interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of East Branch of Lodge Creek at English's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.00 <sup>a</sup>	0.28	0.99	0.23	Dry.	Nil.	Dry.	Nil.
2.....	0.95 <sup>a</sup>	0.08	1.00	0.28	"	"	"	"
3.....	0.90 <sup>a</sup>	0.00	0.90	Nil.	"	"	"	"
4.....	0.90	0.00	0.90	"	"	"	"	"
5.....	0.90	0.00	0.90	"	"	"	"	"
6.....	0.90	0.00	0.90	"	"	"	"	"
7.....	0.90	0.00	Dry.	"	"	"	"	"
8.....	0.90	0.00	"	"	"	"	0.96	0.32
9.....	0.90	0.00	"	"	"	"	0.98	0.44
10.....	0.90	0.00	"	"	"	"	0.98	0.44
11.....	0.90	0.00	"	"	"	"	0.98	0.44
12.....	0.90	0.00	"	"	"	"	0.98	0.44
13.....	1.04	0.57	"	"	"	"	0.98	0.44
14.....	1.87	12.30	"	"	"	"	0.98	0.44
15.....	1.70	9.70	"	"	"	"	0.98	0.44
16.....	1.30	3.70	"	"	"	"	0.98	0.44
17.....	1.25	3.00	"	"	"	"	1.00	0.58
18.....	1.20	2.30	"	"	"	"	1.00	0.58
19.....	1.05	0.65	0.88 <sup>b</sup>	0.02	"	"	1.00	0.58
20.....	1.00	0.28	0.84	Nil.	"	"	1.00	0.58
21.....	1.04 <sup>a</sup>	0.57	0.80	"	"	"	1.00	0.58
22.....	1.08	0.93	0.80	"	"	"	1.00	0.58
23.....	1.08	0.93	0.65	"	"	"	1.00	0.58
24.....	1.10	1.13	Dry.	"	"	"	1.00	0.58
25.....	1.12	1.35	"	"	"	"	0.95	0.26
26.....	1.12	1.35	"	"	"	"	0.95	0.26
27.....	1.15	1.70	"	"	"	"	0.95	0.26
28.....	1.15	1.70	"	"	"	"	0.95	0.26
29.....	1.20	2.30	"	"	"	"	0.95	0.26
30.....	1.20	2.30	"	"	"	"	0.95	0.26
31.....	1.20	2.30	"	"	"	"	0.95 <sup>a</sup>	0.26

<sup>a</sup> Gauge height interpolated.<sup>b</sup> Artificial control installed.

## MONTHLY DISCHARGE of East Branch of Lodge Creek at English's Ranch, for 1915.

(Drainage area 15.6 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	34.00	0.28	5.80	0.3740	0.420	348
May.....	6.40	0.00	1.46	0.0936	0.110	90
June.....	26.00	0.08	4.00	0.2570	0.290	238
July.....	12.30	0.00	1.59	0.1020	0.120	98
August.....	0.28	0.00	0.02	0.00109	0.001	1
September.....	0.00	0.00	0.00	0.0000	0.000	0
October.....	0.58	0.00	0.33	0.0212	0.020	20
The period.....					0.961	795

SESSIONAL PAPER No. 25c

ANDERSON DITCH FROM EAST BRANCH OF LODGE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 23, Tp. 6, Rge. 3, W. 4th Mer., at intake of Robert Anderson's ditch.

*Records available.*—For the irrigation season of 1912-15.

*Gauge.*—Vertical staff. The elevation, of the zero of the gauge was maintained at 97.63 feet during 1912; at 97.64 feet during 1913-14; and at 96.76 feet during 1915.

*Bench-mark.*—A permanent iron bench-mark was installed on the left bank, 10 feet from the gauge and permanent weir. Assumed elevation, 100.00 feet. Elevation of old wooden bench-mark, 99.00 feet; elevation of floor of headgate, 97.73 feet.

*Discharge measurements.*—Made by measured head over permanent 18-inch sharp crested weir, ten feet below rod.

*Artificial control.*—A permanent sharp crested rectangular weir 10 feet below gauge rod. Elevation of crest maintained at 97.76 feet.

*Observer.*—Robert Anderson.

*Remarks.*—This ditch was used for four days during season of 1915 (May 10-13) with total estimated flow of one acre-foot.

J. E. HARTT DITCH.

*Location.*—On NE.  $\frac{1}{4}$  Sec. 15, Tp. 6, Rge. 3, W. 4th Mer., about one-half mile downstream from intake of irrigation ditch.

*Gauge.*—Vertical staff fastened to post driven into bed of ditch near right bank. Elevation of zero maintained at 97.48 feet.

*Bench-mark.*—Permanent iron bench-mark, located on the right bank, near the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gravel and gumbo.

*Observer.*—J. E. Hartt.

*Remarks.*—Station established September 27, 1915, by H.R. Carscallen. No records obtained during 1915.

LODGE CREEK AT HARTT'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 10, Tp. 6, Rge. 3, W. 4th Mer., at Ed. Hartt's ranch.

*Records available.*—July 22, 1909, to June 8, 1915.

*Gauge.*—Vertical staff. Zero elevation of gauge maintained at 86.36 feet during 1911-12. Zero elevation of gauge maintained at 83.33 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Covered with a heavy growth of willow brush.

*Discharge measurements.*—Made by wading or with weir.

*Winter flow.*—Station discontinued during winter season.

*Artificial control.*—There are several small beaver dams near this station.

*Diversions.*—Water is diverted for irrigation above this station by Ed. Hartt and Anderson Brothers.

*Observer.*—Mrs. Clara B. Hartt.

*Remarks.*—This station was discontinued June 8, 1915.

DISCHARGE MEASUREMENTS of Lodge Creek at Hartt's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
June 8 .....	H. W. Rowley .....	10	12 3	0 67	2 06	8 2
Oct. 6 .....	do .....				0 65	Nil.
Oct. 29 .....	do .....				0 67	"

## DAILY GAUGE HEIGHT AND DISCHARGE of Lodge Creek at Hartt's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			4.95	40.00	1.90	1.78	1.90	1.78
2			11.60	304.00	1.90	1.78	2.15	2.84
3			9.80	232.00	1.90	1.78	2.45	4.60
4			9.00	200.00	1.90	1.78	7.45	138.00
5			7.00	120.00	1.90	1.78	6.50	100.00
6			5.60	64.00	1.90	1.78	5.70	68.00
7			4.35	28.00	1.90	1.78	3.30	12.60
8			4.20	26.00	1.90	1.78	2.96	9.00
9			3.92	21.00	1.90	1.78		
10			3.85	19.80	1.90	1.78		
11			3.70	17.60	1.90	1.78		
12			3.55	15.60	1.90	1.78		
13			3.55	15.60	1.85	1.59		
14			3.55	15.60	1.90	1.78		
15			3.40	13.80	2.16	2.90		
16			3.20	11.50	3.10	10.40		
17			3.05	9.90	2.85	7.90		
18			2.95	8.90	2.70	6.50		
19			2.95	8.90	2.65	6.10		
20			2.80	7.40	2.40	4.30		
21	2.45	4.60	2.48	4.90	2.10	2.60		
22	3.60	16.30	2.45	4.60	2.05	2.40		
23	6.05	82.00	2.41	4.40	2.02	2.30		
24	7.92	156.00	2.40	4.30	2.00	2.20		
25	5.55	62.00	2.30	3.70	1.95	1.98		
26	4.20	26.00	2.28	3.60	1.93	1.90		
27	4.70	35.00	2.21	3.20	1.90	1.78		
28	4.65	34.00	2.10	2.60	1.87	1.67		
29	4.10	24.00	2.00	2.20	1.87	1.67		
30	3.80	19.00	1.95	1.98	1.85	1.59		
31	3.70	17.60			1.85	1.59		

NOTE.—1914 discharge curve used to obtain discharge for 1915.

## MONTHLY DISCHARGE of Lodge Creek at Hartt's Ranch, for 1915.

(Drainage area 80 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31)	156.00	4.60	43.00	0.5380	0.22	944
April	304.00	1.98	40.00	0.5000	0.56	2,380
May	10.40	1.59	2.70	0.0338	0.04	166
June (1-8)	138.00	1.78	42.00	0.5250	0.16	668
The period					0.98	4,158

This station was discontinued June 8th, 1915.

## A. J. SUISTE NORTH DITCH NEAR EAGLE BUTTE.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 9, Tp. 6, Rge. 3, W. 4th Mer., one-quarter of a mile below intake of ditch.*Gauge.*—Vertical staff driven into the bed of the stream near the left bank. Zero of gauge maintained at 99.88 feet since establishment.*Bench-mark.*—Top of three-quarters of an inch iron post located on the right bank near the gauge. Assumed elevation, 103.00 feet.*Channel.*—Composed of gumbo.*Discharge measurements.*—Made with meter or weir.*Observer.*—J. E. Hartt.*Remarks.*—This station was established September 27, 1915, by H. R. Carscallen, too late in the season to obtain records for the irrigation season of 1915.

SESSIONAL PAPER No. 25c

A. J. SUISTE SOUTH DITCH NEAR EAGLE BUTTE.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 4, Tp. 6, Rge. 3, W. 4th Mer., fifty feet below dam and intake of ditch.

*Gauge.*—Vertical staff driven into bed of stream near the right bank. Elevation of zero of gauge maintained at 96.47 feet since establishment.

*Bench-mark.*—Top of a three-quarters of an inch iron post located on the right bank near the gauge rod. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—J. E. Hartt.

*Remarks.*—This station was established September 27, 1915, by H. R. Carscallen, too late to obtain records for the irrigation season of 1915.

WM. MITCHELL UPPER DITCH FROM LODGE CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 29, Tp. 5, Rge. 2, W. 4th Mer., about one mile downstream from dam and intake.

*Gauge.*—Vertical staff driven in the bed of the ditch near the left bank. The zero of the gauge was established and maintained at 97.05 feet.

*Bench-mark.*—Permanent iron bench-mark 320 feet downstream from the gauge on the left bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gravel gumbo.

*Discharge measurements.*—Made with meter or weir.

*Artificial control.*—A log control was placed in the bed of the ditch about 30 feet below the gauge.

*Observer.*—James Mitchell.

*Remarks.*—This station was established by H. R. Carscallen July 6, 1915, too late to obtain records for the irrigation season of 1915. The ditch was used for a few days during the spring floods of 1915.

WM. MITCHELL'S LOWER DITCH NEAR THELMA.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 15, Tp. 5, Rge. 2, W. 4th Mer., about 70 feet downstream from dam and intake on Spring Creek.

*Gauge.*—Vertical staff driven into the bed of the ditch near the left bank. The zero of the gauge was established and maintained at 95.55 feet.

*Bench-mark.*—Top of iron pin set on the right bank 10 feet from gauge. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made from measured head over a permanent sharp crested rectangular weir, located 30 feet below the gauge. The elevation of the crest of the weir is maintained at 96.66 feet.

*Observer.*—James Mitchell.

*Remarks.*—This station was established July 7, 1915, by H. R. Carscallen. No records were obtained during 1915.

LODGE CREEK AT HESTER'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 25, Tp. 3, Rge. 1, W. 4th Mer., at Hester Brothers' ranch. This station was moved from the NE.  $\frac{1}{4}$  Sec. 36, Tp. 3, Rge. 1, W. 4th Mer., on April 29, 1914.

*Records available.*—August 31, 1912, to October 31, 1914.

*Gauge.*—Vertical staff. Elevation of zero of gauge at original station (records from August 31, 1912, to April 28, 1914) 87.22 feet; at new station from April 28, 1914, to October 31, 1914. Elevation of zero of gauge 89.31 feet.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet. Located 6 $\frac{1}{2}$  feet west of the I.P. stake and 387 feet southwest of Hester's house.

*Channel.*—Practically permanent.

*Discharge measurements.*—Made by wading or with a weir.

*Winter flow.*—Station discontinued during winter season.

*Artificial control.*—There are many small beaver dams across the creek near this station both above the station and below, but as the channel is narrow they do not store much water and have very little effect upon the flow of the creek.

*Diversions.*—Geo. Legg and Jas. Mitchell use water for irrigation between this station and the station at Hartt's ranch.

*Remarks.*—Station discontinued during 1915 as the records were not considered of sufficient value to warrant the expense of maintenance.

## M., M. M. AND J. M. SPANGLER DITCH FROM LODGE CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Section 24, Tp. 2, Rge. 30, W. 3rd Mer., two miles downstream from dam and intake and one-half mile above reservoir No. 1.

*Gauge.*—Vertical staff driven into bed of ditch near the right bank. Zero of gauge maintained at 96.67 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark situated six feet from the gauge on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or weir. Initial point of soundings is the bench-mark.

*Observer.*—None.

*Remarks.*—This station was established August 2, 1915, by H. R. Carscallen. No water used after station was established.

## M. LYNCH DITCH FROM LODGE CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 19, Tp. 2, Rge. 29, W. 3rd Mer., about 500 feet downstream from flume over Lodge Creek.

*Gauge.*—Vertical staff driven into bed of ditch near right bank. Zero of gauge maintained at 96.75 feet.

*Bench-mark.*—Top of iron pin located on the right bank six feet from the gauge rod. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or weir. Initial point for soundings is the bench-mark.

*Observer.*—M. Lynch.

*Remarks.*—This station was established August 9, 1915, by H. R. Carscallen. No water used since station was established.

## D. A. HAMMOND DITCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 5, Tp. 2, Rge. 29, W. 3rd Mer., about one-quarter of a mile upstream from two-way gate where ditch divides.

*Gauge.*—Vertical staff. The zero of the gauge was established and maintained at 98.58 feet.

*Bench-mark.*—Top of iron pin on the left bank of ditch, fifteen feet from gauge rod. Assumed elevation 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made by wading with current meter or with weir.

*Observer.*—D. A. Hammond.

*Remarks.*—This station was established August 2, 1915, by H. R. Carscallen and no water was used for irrigation after that date.

## MRS. A. F. MOCK DITCH NEAR THELMA.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 21, Tp. 7, Rge. 2, W. 4th Mer., one-half mile below intake.

*Gauge.*—Vertical staff driven into the bed of the ditch near the left bank. The elevation of the zero of gauge maintained at 97.24 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gravel and loam.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Adam Storm.

*Remarks.*—This station was established September 29, 1915, by H. R. Carscallen. No water was used for irrigation during 1915.

## MUIR AND FRANTZEN DITCH FROM MIDDLE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 36, Tp. 5, Rge. 2, W. 4th Mer., about 100 feet upstream from intake of branch ditch.

*Records available.*—No water was used after station was established.

*Gauge.*—Vertical staff driven into bed of ditch near right bank. Elevation of zero of gauge maintained at 96.86 feet since establishment.

*Bench-mark.*—Top of iron stake on the right bank, 8 feet from the gauge rod.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or with a weir.

*Artificial control.*—A control made of small rock was built 15 feet below the gauge.

*Observer.*—Ole Frantzen.

*Remarks.*—This station was established July 6, 1915, by H. R. Carscallen.

## SESSIONAL PAPER No. 25c

## LINK'S EAST DITCH, NORTH BRANCH, FROM DRY COULEE.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 32, Tp. 5, Rge. 1, W. 4th Mer., one hundred and ten feet from forks of ditch.

*Gauge.*—Vertical staff driven into the bed of the ditch near the left bank. Elevation of zero maintained at 99.07 feet since establishment.

*Bench-mark.*—The bench-mark for this station is the same as for the other two stations in Link's ditches and is located at the station on the South Branch of the East Ditch. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with a meter or with a weir.

*Observer.*—H. C. Link.

*Remarks.*—This station was established July 25, 1914, by J. A. Tom.

## LINK'S EAST DITCH, SOUTH BRANCH, FROM DRY COULEE.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 32, Tp. 5, Rge. 1, W. 4th Mer., sixty feet from forks of ditch.

*Gauge.*—Vertical staff driven into the bed of the ditch near the left bank. Zero of gauge maintained at 97.32 feet since establishment.

*Bench-mark.*—Top of a three-quarter of an inch iron post near the gauge rod on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—H. C. Link.

*Remarks.*—This station was established July 25, 1914, by J. A. Tom.

## LINK'S WEST DITCH FROM DRY COULEE.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 32, Tp. 5, Rge. 1, W. 4th Mer., about one hundred feet from the headgate.

*Gauge.*—Vertical staff driven into the bed of the ditch near the right bank. Zero of gauge maintained at 100.07 feet since establishment.

*Bench-marks.*—Same as for Link's East Ditch, South Branch. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo with stones.

*Discharge measurements.*—Made with a meter or weir.

*Observer.*—H. C. Link.

*Remarks.*—This station was established July 25, 1914, by J. A. Tom.

## MIDDLE CREEK AT MACKINNON'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 35, Tp. 5, Rge. 1, W. 4th Mer., at Angus MacKinnon's ranch.

*Records available.*—From June 21, 1910, to April 17, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 91.49 feet during 1910-11. Zero of gauge maintained at 91.57 feet during 1912. Zero of gauge maintained at 91.47 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet

*Channel.*—Practically permanent.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—A. D. MacKinnon.

*Remarks.*—Gauge records at this station discontinued on April 17.

## DISCHARGE MEASUREMENTS of Middle Creek at MacKinnon's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section	Mean Velocity	Gauge Height	Discharge
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Cu. ft.
April 20	H. W. Rowley	a			0.84	1.46
June 7	do	a			0.63	0.73
Aug. 18	do	14	4.70	1.10	1.15	4.80
Sept. 10	do	a			0.43	0.71
Oct. 4	do	a			0.90	0.90

a Weir measurement



## DAILY GAUGE HEIGHT AND DISCHARGE of Middle Creek at MacKinnon's Ranch, for 1915.

DAY.	March.		April.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			3.31	50.0
2.....			3.91	68.0
3.....			6.71	152.0
4.....			5.71	122.0
5.....			5.91	128.0
6.....			5.86	127.0
7.....			2.53	28.0
8.....			2.33	22.0
9.....			2.01	15.1
10.....			1.83	11.7
11.....			1.71	9.8
12.....			1.49	6.8
13.....			1.25	4.2
14.....			1.02	2.4
15.....			1.53	7.3
16.....			1.44	6.2
17.....			1.24a	4.2
18.....				
19.....				
20.....				
21.....				
22.....	3.86	67		
23.....	3.90	68		
24.....	5.48	115		
25.....	4.51	86		
26.....	3.84	66		
27.....	3.25	40		
28.....	3.11	44		
29.....	3.02	42		
30.....	2.93	39		
31.....	2.71	32		

a Station discontinued.

## MONTHLY DISCHARGE of Middle Creek at MacKinnon's Ranch, for 1915.

(Drainage area 121 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	115	32.0	60	0.498	0.18	1,188
April (1-17).....	152	2.4	45	0.371	0.23	1,517
The period.....					0.41	2,705

Station discontinued April 17.

## MIDDLE CREEK AT ROSS' RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 30, Tp. 5, Rge. 29, W. 3rd Mer., at Maurice Ross' ranch.*Records available.*—From July 20, 1909, to October 31, 1915.*Gauge.*—Vertical staff. Zero of gauge maintained at 3,291.61 during 1909-10. Zero of gauge maintained at 3,290.99 during 1911; zero of gauge maintained at 3,290.98 during 1912-15.*Bench-mark.*—Permanent iron bench-mark. Elevation, 3,297.37 feet above sea level. (Irrigation Surveys.)*Channel.*—Practically permanent.*Discharge measurements.*—Made by wading or with a weir.*Winter flow.*—Station discontinued during winter season.

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*Artificial control.*—The flow at this station is regulated to some extent by two dams, one at W. X. Wright's and the other at MacKinnon's ranch.

*Diversions.*—Water is diverted for irrigation above this station by W. X. Wright and Angus MacKinnon.

*Observer.*—Mrs. W. M. Ross.

DISCHARGE MEASUREMENTS of Middle Creek at Ross' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 22.....	H. R. Carscallen.....	33.0	62.00	1.30	3.41a	81.00
Mar. 23.....	do.....	62.0	109.00	1.33	3.64a	145.00
Mar. 27.....	do.....	17.5	50.00	2.86	3.33	144.00
April 1.....	do.....	22.2	26.00	1.56	1.97	40.00
April 3.....	do.....	30.2	55.00	1.84	2.88	101.00
April 5.....	do.....	183.0	253.00	1.68	4.77	425.00
April 9.....	do.....	13.4	18.00	1.38	1.74	26.00
April 20.....	H. W. Rowley.....	b			0.74	0.81
April 26.....	do.....	b			0.67	0.58
May 10.....	do.....	b			0.65	0.49
June 7.....	do.....	b			0.67	0.44
June 26.....	do.....	b			0.67	0.44
June 28.....	do.....	b			0.64	0.22
July 21.....	do.....	6.0	2.20	0.91	0.90	2.10
Aug. 17.....	do.....	b			0.64	0.22
Aug. 18.....	do.....	51.0	164.00	0.90	3.38	148.00
Sept. 10.....	do.....	b			0.64	0.39
Oct. 4.....	do.....	b			0.64	0.40

a Gauge heights affected by ice.

b Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Middle Creek at Ross' Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.05	45.00	0.67	0.46	0.72	0.78
2.....			2.25	57.00	0.67	0.46	0.82	1.31
3.....			4.79	431.00	0.67	0.46	0.92	2.40
4.....			4.82	440.00	0.67	0.46	0.85	1.65
5.....			4.62	381.00	0.67	0.46	0.70	0.59
6.....			3.76	196.00	0.67	0.46	0.68	0.50
7.....			3.22	131.00	0.67	0.46	0.67	0.46
8.....			2.42	67.00	0.67	0.46	0.67	0.46
9.....			1.66	25.00	0.67	0.46	0.67	0.46
10.....			1.43	16.20	0.67 <sup>b</sup>	0.46	0.67	0.46
11.....			1.33	12.90	0.67	0.46	0.67	0.46
12.....			1.27	11.36	0.67	0.46	0.68	0.50
13.....			1.13	6.90	0.68	0.50	0.67	0.46
14.....			1.04	4.60	0.70	0.59	0.67	0.46
15.....			0.99	3.40	0.76	0.96	0.67	0.46
16.....			0.99	3.40	0.72	0.71	0.67	0.46
17.....			0.99	3.40	0.69	0.55	0.68	0.50
18.....			0.99	3.40	0.68	0.50	0.67	0.46
19.....			0.97	3.20	0.67	0.46	0.68	0.50
20.....			0.73	0.77	0.67	0.46	0.68	0.50
21.....	2.94 <sup>c</sup>	50	0.70	0.59	0.67	0.46	0.67	0.46
22.....	3.41 <sup>c</sup>	81	0.69	0.55	0.67	0.46	0.67	0.46
23.....	3.64 <sup>c</sup>	145	0.69	0.55	0.67	0.46	0.67	0.46
24.....	4.04 <sup>c</sup>	203	0.69	0.55	0.67	0.46	0.67	0.46
25.....	4.40 <sup>c</sup>	301	0.69	0.55	0.67	0.46	0.67	0.46
26.....	4.19 <sup>c</sup>	256	0.67	0.46	0.68	0.50	0.68	0.50
27.....	3.04	115	0.67	0.46	0.68	0.50	0.64	0.37
28.....	2.38	65	0.67 <sup>a</sup>	0.46	0.67	0.46	0.64	0.37
29.....	2.02	43	0.67	0.16	0.70	0.59	0.66	0.41
30.....	1.60	25	0.67	0.46	0.68	0.50	0.64	0.34
31.....	2.06	46			0.70	0.59		

a to b Gauge heights interpolated.

c Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Middle Creek at Ross' Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.64	0.33	0.66	0.41	0.62	0.24	0.65	0.37
2.....	0.64	0.33	0.66	0.41	0.64	0.3	0.65	0.37
3.....	0.64	0.33	0.64	0.33	0.66	0.41	0.65	0.37
4.....	0.64	0.33	0.64	0.33	0.64	0.33	0.65	0.37
5.....	0.64	0.33	0.64	0.33	0.64	0.33	0.65	0.37
6.....	0.64	0.33	0.64	0.33	0.64	0.33	0.65	0.37
7.....	0.82	1.38	0.64	0.33	0.64	0.33	0.65	0.37
8.....	0.77	1.02	0.64	0.33	0.64	0.33	0.65	0.37
9.....	0.65	0.37	0.64	0.33	0.64	0.33	0.65	0.37
10.....	0.64	0.33	0.63	0.28	0.64	0.33	0.65	0.37
11.....	0.64	0.33	0.61	0.19	0.64	0.33	0.65	0.37
12.....	0.64	0.33	0.60	0.15	0.66	0.41	0.65	0.37
13.....	0.64	0.33	0.60	0.15	0.74	0.83	0.65	0.37
14.....	1.32	12.60	0.60	0.15	0.67	0.46	0.65	0.37
15.....	1.45	17.00	0.60	0.15	0.66	0.41	0.65	0.37
16.....	0.98	3.30	0.60	0.15	0.65	0.37	0.65	0.37
17.....	1.00	3.60	0.60	0.15	0.64	0.33	0.65	0.27
18.....	1.27	11.10	3.11	121.00	0.65	0.37	0.65	0.37
19.....	1.15	7.50	1.68	26.00	0.65	0.37	0.65	0.37
20.....	1.08	5.50	3.20	129.00	0.65	0.37	0.65	0.37
21.....	0.92	2.40	2.82	97.00	0.65	0.37	0.65	0.37
22.....	0.86	1.74	1.80	32.00	0.65	0.37	0.65	0.37
23.....	0.76	0.96	1.50	19.00	0.65	0.37	0.65	0.37
24.....	0.75	0.89	0.94	2.70	0.65	0.37	0.65	0.37
25.....	0.73	0.77	0.76	0.96	0.65	0.37	0.65	0.37
26.....	0.72	0.71	0.70	0.59	0.65	0.37	0.65	0.37
27.....	0.70	0.59	0.64	0.33	0.65	0.27	0.65	0.37
28.....	0.70	0.59	0.63	0.28	0.65	0.37	0.64	0.33
29.....	0.70	0.59	0.62	0.24	0.65	0.37	0.64	0.33
30.....	0.72	0.71	0.62	0.24	0.65	0.37	0.64	0.33
31.....	0.70	0.59	0.62	0.24	.....	.....	0.64	0.33

## MONTHLY DISCHARGE of Middle Creek at Ross' Ranch, for 1915.

(Drainage area 162 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31).....	301.00	25.00	121.00	0.74700	0.310	2,637
April.....	440.00	0.46	62.00	0.38300	0.450	3,689
May.....	0.96	0.46	0.51	0.00315	0.004	31
June.....	2.40	0.33	0.60	0.00370	0.004	36
July.....	17.00	0.33	2.50	0.01540	0.020	154
August.....	129.00	0.15	14.00	0.08640	0.100	861
September.....	0.83	0.24	0.37	0.00228	0.003	23
October.....	0.37	0.33	0.36	0.00222	0.003	22
The period.....					0.87	7,453

SESSIONAL PAPER No. 25c

B. A. JAHN DITCH FROM MIDDLE CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 8, Tp. 4, Rge. 29, W. 3rd Mer., 700 feet downstream from intake of ditch.

*Gauge.*—Vertical staff driven into bed of ditch near right bank. Zero of gauge maintained at 95.45 feet.

*Bench-mark.*—Top of iron stake ten feet from gauge rod on left bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with weir or meter. Initial point for sounding is the bench-mark.

*Observer.*—B. A. Jahn.

*Remarks.*—This station was established July 31, 1915, by H. R. Carscallen. No water used after station was established.

W. B. GREGG DITCH FROM MIDDLE CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 34, Tp. 3, Rge. 29, W. 3rd Mer., one mile downstream from intake of B. A. Jahn's ditch near two-way gate where B. A. Jahn diverts water for irrigation.

*Gauge.*—Vertical staff driven into bed of ditch near right bank. Zero of gauge maintained at 96.20 feet since establishment.

*Bench-mark.*—Top of iron post, 12 feet from gauge rod, on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or weir. Initial point for soundings is bench-mark.

*Observer.*—B. A. Jahn.

*Remarks.*—This station was established July 30, 1915, by H. R. Carscallen. No water was used after the station was established.

E. J. PEACHEY DITCH FROM MIDDLE CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 4, Tp. 3, Rge. 29, W. 3rd Mer., one-half mile below dam and intake and in the flume along cut bank of Middle Creek.

*Gauge.*—Vertical staff nailed to right wall of flume. Zero of gauge maintained at 94.10 feet since establishment.

*Bench-mark.*—Top of iron post located 150 feet downstream from gauge on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Wooden flume.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—E. J. Peachey.

*Remarks.*—This station was established July 29, 1915, by H. R. Carscallen. No water was used after the station was established.

MIDDLE CREEK AT HAMMOND'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 4, Tp. 2, Rge. 29, W. 3rd Mer., at D. A. Hammond's ranch. *Records available.*—June 13, 1910, to October 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero of gauge maintained at 87.48 feet, during 1910. Elevation of zero of gauge maintained at 87.60 feet, during 1911-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Slightly shifting during high water stages.

*Discharge measurements.*—Made by wading or with a weir.

*Winter flow.*—Station discontinued during winter season.

*Diversions.*—Water is diverted above this station by W. B. Gregg, W. S. Peachey and E. J. Jahn.

*Observer.*—Mrs. D. A. Hammond.

## DISCHARGE MEASUREMENTS of Middle Creek at Hammond's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 27.....	H. W. Rowley.....	30.0	106.00	1.90	5.42	203.00
May 31.....	do.....	26.0	52.40	1.69	4.18 <sup>a</sup>	88.00
April 5.....	do.....	40.0	200.00	2.10	7.10	422.00
April 9.....	do.....	25.0	35.40	1.78	3.43	63.00
April 12.....	do.....	19.0	17.60	1.47	2.66	26.00
April 24.....	do.....	7.0	2.35	1.40	1.81	3.30
May 22.....	do.....	<i>b</i>			1.55	0.12
June 22.....	do.....	<i>b</i>			1.44	0.06
July 16.....	do.....	23.0	21.80	0.95	2.75 <sup>a</sup>	21.00
Aug. 10.....	do.....	<i>b</i>			1.49	1.81
Sept. 29.....	do.....	<i>b</i>			1.25	0.69

<sup>a</sup> Gauge height affected by backwater from Lodge Creek.<sup>b</sup> Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Middle Creek at Hammond's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			6.05	270.00	1.60	1.50	1.45	0.70
2.....			6.05	270.00	1.57	1.32	1.90	5.00
3.....			5.55	215.00	1.55	1.20	2.40	17.00
4.....			6.05	270.00	1.52	1.02	2.10	9.00
5.....			7.10	422.00	1.81	0.96	2.10	9.00
6.....			6.75	367.00	1.49	0.86	2.00	7.00
7.....			4.19	103.00	1.47	0.78	1.95	6.00
8.....			3.43	60.00	1.46	0.74	1.90	5.00
9.....			3.23	50.00	1.44	0.66	1.80	3.40
10.....			3.03	40.00	1.43	0.62	1.70	2.30
11.....			2.95	37.00	1.41	0.54	1.64	1.82
12.....			2.66	25.00	1.40	0.50	1.60	1.50
13.....			2.55	22.00	1.40	0.50	1.55	1.20
14.....			2.50	20.00	1.39	0.47	1.50	0.90
15.....			2.35	15.50	1.41	0.54	1.48	0.82
16.....			2.28	13.50	1.86	4.40	1.47	0.78
17.....			2.20	11.50	1.88	4.70	1.45	0.70
18.....			2.12	9.50	1.76	3.00	1.44	0.66
19.....			2.00	11.50	1.70	2.30	1.54	1.14
20.....			2.00	11.50	1.66	1.98	1.52	1.02
21.....			1.96	6.20	1.55	1.20	1.50	0.90
22.....	1.75 <sup>a</sup>	2.8	1.93	5.60	1.54	1.14	1.48	0.82
23.....	1.75	2.8	1.89	4.80	1.52	1.02	1.47	0.78
24.....	5.04	168.0	1.80	3.40	1.52	1.02	1.45	0.70
25.....	5.55	215.0	1.76	3.00	1.50	0.90	1.44	0.66
26.....	6.05	270.0	1.74	2.70	1.49	0.86	1.44	0.66
27.....	6.05	270.0	1.71	2.40	1.48	0.82	1.43	0.62
28.....	5.30	191.0	1.68	2.10	1.48	0.82	1.42	0.58
29.....	4.95	160.0	1.66	1.98	1.47	0.78	1.41	0.54
30.....	3.85	82.0	1.63	1.74	1.46	0.74	1.40	0.50
31.....	5.15	177.0			1.46	0.74		

<sup>a</sup> Creek started to run March 22.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Middle Creek at Hammond's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.40	0.50	1.56	1.26	1.48	0.82	1.22	0.04
2.....	1.38	0.44	1.53	1.08	1.45	0.70	1.21	0.02
3.....	1.35	0.35	1.48	0.82	1.49	0.86	1.21	0.02
4.....	1.32	0.26	1.42	0.58	1.47	0.78	1.20	0.00
5.....	1.32	0.26	1.40	0.50	1.45	0.70	1.20	0.00
6.....	1.31	0.23	1.35	0.35	1.44	0.66	1.19	0.00
7.....	1.30	0.20	1.31	0.23	1.43	0.62	1.19	6.00
8.....	1.40	0.50	1.29	0.18	1.42	0.58	1.19	0.00
9.....	1.38	0.44	1.26	0.12	1.40	0.50	1.19	0.00
10.....	1.34	0.32	1.23	0.06	1.40	0.50	1.60	1.50
11.....	1.33	0.29	1.22	0.04	1.39	0.47	1.55	1.20
12.....	1.32	0.26	1.21	0.02	1.38	0.44	1.52	1.02
13.....	1.95	6.00	1.20	0.00	1.38	0.44	1.50	0.90
14.....	1.98	6.60	1.20	0.00	1.37	0.41	1.47	0.78
15.....	4.05	94.00	1.19	0.00	1.36	0.38	1.46	0.74
16.....	2.75	29.00	1.19	0.00	1.36	0.38	1.45	0.70
17.....	3.70	73.00	1.19	0.00	1.36	0.38	1.44	0.66
18.....	2.70	27.00	1.19	0.00	1.35	0.35	1.44	0.66
19.....	2.40	17.00	1.19	0.00	1.35	0.35	1.43	0.62
20.....	2.25	12.80	3.55	65.00	1.34	0.32	1.45	0.70
21.....	2.15	10.20	2.90	35.00	1.32	0.26	1.45	0.70
22.....	2.08	8.60	4.05	94.00	1.30	0.20	1.43	0.62
23.....	2.00	7.00	3.40	58.00	1.28	0.16	1.39	0.47
24.....	1.97	6.40	2.60	23.00	1.27	0.14	1.35	0.35
25.....	1.90	5.00	2.20	11.50	1.25	0.12	1.35	0.35
26.....	1.95	6.00	1.80	3.40	1.25	0.10	1.35	0.35
27.....	1.88	4.70	1.65	1.90	1.24	0.08	1.34	0.32
28.....	1.70	2.30	1.60	1.50	1.23	0.06	1.34	0.32
29.....	1.65	1.90	1.58	1.38	1.23	0.06	1.34	0.32
30.....	1.62	1.66	1.55	1.20	1.22	0.04	1.34	0.32
31.....	1.60	1.50	1.50	0.90	.....	.....	1.33	0.29

a Gauge height interpolated.

## MONTHLY DISCHARGE of Middle Creek at Hammond's Ranch, for 1915.

(Drainage area 315 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March.....	270.00	0.00	50.00	0.15700	0.480	3,050
April.....	422.00	1.74	76.00	0.24100	0.270	4,522
May.....	4.70	0.47	1.25	0.00397	0.005	77
June.....	17.00	0.50	2.70	0.00857	0.010	161
July.....	94.00	0.20	10.50	0.03370	0.040	646
August.....	94.00	0.00	9.70	0.03080	0.040	596
September.....	0.86	0.04	0.40	0.00127	0.001	24
October.....	1.50	0.00	0.45	0.00143	0.002	28
The period.....					0.548	9,104

## LODGE CREEK AT WILLOW CREEK POLICE DETACHMENT.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 12, Tp. 1, Rge. 29, W. 3rd Mer., at the Willow Creek Police Detachment.

*Records available.*—From April 25, 1910, to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 2,722.98 feet during 1910. Zero of gauge maintained at 2,721.48 feet during 1911. Zero of gauge maintained at 2,721.03 feet during 1912–15.

*Bench-mark.*—Permanent iron bench-mark, located on the right bank, at the cable support. Elevation, 2,734.02 feet above mean sea level. (International Boundary Survey.)

*Channel.*—Practically permanent.

*Discharge measurements.*—Made at station from cable car, by wading or with a weir.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—Chas. Hayes, March to May 22; Geo. J. Kroft, May 23 to June 14; W. H. Tudgay, June 15 to October 31.

DISCHARGE MEASUREMENTS of Lodge Creek at Willow Creek Police Detachment, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 25.....	H. W. Rowley.....	105	484.0	1.14	8.37	553.00
Mar. 29.....	do.....	95	431.0	1.04	8.10	447.00
April 1.....	do.....	94	294.0	3.25	6.57	957.00
April 5.....	do.....	99	354.0	3.57	7.00	1,266.00
April 10.....	do.....	38	61.4	2.05	3.01	126.00
April 23.....	do.....	19	18.4	0.84	1.76	15.50
May 22.....	do.....	<i>a</i>			1.41	2.20
June 23.....	do.....	6	2.3	0.98	1.46	2.20
July 16.....	do.....	48	108.0	2.49	4.06	270.00
July 18.....	do.....	76	181.0	2.67	5.00	483.00
Aug. 13.....	do.....	<i>a</i>			1.19	0.16
Sept. 2.....	do.....	7	3.6	1.46	1.55	5.30
Sept. 25.....	do.....	<i>a</i>			1.25	0.40
Oct. 22.....	do.....	<i>a</i>			1.29	0.40

*a* Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Lodge Creek at Willow Creek Police Detachment, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			6.57	960.00	1.37	1.38	1.28	0.47
2.....			6.63	993.00	1.33	0.90	1.34	1.00
3.....			6.89	1177.00	1.31	0.70	2.38	58.00
4.....			7.14	1401.00	1.29	0.54	1.90	22.00
5.....			6.87	1162.00	1.27	0.41	1.70	11.60
6.....			5.91	695.00	1.28	0.47	1.68	10.70
7.....			4.45	343.00	1.26	0.34	2.13	37.00
8.....			3.77	226.00	1.28	0.47	2.46	66.00
9.....			3.31	163.00	1.25	0.28	2.27	49.00
10.....			2.85	108.00	1.24	0.24	2.08	34.00
11.....			2.75	97.00	1.24	0.24	1.92	23.00
12.....			2.49	69.00	1.22	0.17	1.81	17.10
13.....			2.38	58.00	2.49	69.00	1.74	13.60
14.....			2.28	49.00	2.28	49.00	1.70	11.60
15.....			2.21	44.00	2.22	45.00	1.64	8.90
16.....			2.12	37.00	2.05	32.00	1.60	7.10
17.....			2.11	36.00	1.87	20.00	1.59	6.70
18.....			2.06	32.00	1.79 <sup>a</sup>	16.10	1.54	4.90
19.....			1.99	27.00	1.70 <sup>a</sup>	11.60	1.55	5.20
20.....			1.94	24.00	1.61 <sup>a</sup>	7.60	1.53	4.60
21.....			1.88	21.00	1.56 <sup>a</sup>	5.60	1.50	3.80
22.....			1.78	15.60	1.48 <sup>a</sup>	3.40	1.48	3.40
23.....			1.75	14.10	1.58	6.30	1.45	2.70
24.....	5.94 <sup>c</sup>	123 <sup>b</sup>	1.76	14.60	1.54	4.90	1.41	1.98
25.....	8.50	588 <sup>b</sup>	1.73	13.10	1.50	3.80	1.36	1.24
26.....	8.00	456 <sup>b</sup>	1.70	11.60	1.46	2.90	1.38	1.52
27.....	7.72	390 <sup>b</sup>	1.65	9.40	1.40	1.80	1.34	1.00
28.....	8.05	447 <sup>b</sup>	1.58	6.30	1.34	1.00	1.30	0.60
29.....	8.34	502 <sup>b</sup>	1.47	3.10	1.29	0.54	1.29	0.54
30.....	8.10	447 <sup>b</sup>	1.39	1.66	1.28	0.47	1.28	0.47
31.....	8.13	450 <sup>b</sup>			1.26	0.34		

*a* Gauge heights interpolated.

*b* Ice conditions.

*c* Creek started to flow Mar. 24th.



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DAILY GAUGE HEIGHT AND DISCHARGE of Lodge Creek at Willow Creek Police Detachment, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.26	0.34	1.58	6.30	1.50	3.80	1.24	0.24
2.....	1.23	0.21	1.52	4.40	1.54	4.90	1.24	0.24
3.....	1.20	0.10	1.46	2.90	1.52	4.40	1.23	0.21
4.....	1.18	0.08	1.44	2.50	1.48	3.40	1.23	0.21
5.....	1.18	0.08	1.40	1.80	1.45	2.70	1.23	0.21
6.....	1.18	0.07	1.36	1.24	1.44	2.50	1.22	0.17
7.....	1.18	0.07	1.34	1.00	1.40	1.80	1.21	0.14
8.....	1.28	0.47	1.30	0.60	1.40	1.80	1.21	0.14
9.....	1.20	0.10	1.25	0.28	1.38	1.52	1.20	0.10
10.....	1.34	1.00	1.22	0.21	1.35	1.10	1.20	0.10
11.....	1.76	14.60	1.22	0.17	1.35	1.10	1.20	0.10
12.....	1.66	9.80	1.18	0.08	1.40	1.80	1.20	0.10
13.....	1.66	9.80	1.18	0.08	1.40	1.80	1.20	0.10
14.....	1.92	23.00	1.20	0.10	1.38	1.52	1.20	0.10
15.....	4.77	405.00	1.19	0.09	1.36	1.24	1.20	0.10
16.....	4.67	385.00	1.19	0.09	1.35	1.10	1.20	0.10
17.....	4.12	283.00	1.18	0.08	1.34	1.00	1.34	1.00
18.....	4.71	393.00	1.14	0.04	1.34	1.00	1.32	0.80
19.....	3.70	216.00	1.12	0.01	1.34	1.00	1.31	0.70
20.....	2.82	104.00	1.10	0.00	1.32	0.50	1.29	0.54
21.....	2.40	60.00	1.37	1.38	1.30	0.60	1.28	0.47
22.....	2.18	41.00	5.01	456.00	1.30	0.60	1.28	0.47
23.....	2.02	29.00	3.02	127.00	1.28	0.47	1.28	0.47
24.....	1.92	23.00	2.30	51.00	1.27	0.41	1.28	0.47
25.....	1.84	18.80	2.10	35.00	1.26	0.34	1.26	0.34
26.....	1.80	16.60	1.92	23.00	1.25	0.28	1.25	0.28
27.....	1.74	12.60	1.82	17.70	1.25	0.28	1.25	0.28
28.....	1.68	10.70	1.72	12.60	1.25	0.28	1.25	0.28
29.....	1.65	9.30	1.66	9.80	1.24	0.24	1.25	0.28
30.....	1.66	9.80	1.60	7.10	1.26	0.34	1.25	0.28
31.....	1.62	8.00	1.54	4.90	.....	.....	1.25	0.28

MONTHLY DISCHARGE of Lodge Creek at Willow Creek Police Detachment, for 1915.

(Drainage area 823 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
March (21-31).....	588.00	0.00	110.00	0.13400	0.110	6,764
April.....	1401.00	1.66	260.00	0.31600	0.270	13,471
May.....	69.00	0.17	9.30	0.01130	0.010	572
June.....	66.00	0.47	13.70	0.01670	0.020	815
July.....	405.00	0.67	67.00	0.08140	0.080	4,170
August.....	456.00	0.00	25.00	0.03040	0.040	1,597
September.....	4.90	0.21	1.17	0.00170	0.002	87
October.....	1.00	0.10	0.30	0.00036	0.000	18
The period.....	.....	.....	.....	.....	1.662	29,284

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Lodge Creek drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Discharge.	
				Imperial gallons per 24 hours.	Sec.-ft.
Sept. 11.....	H. W. Rowley.....	Adam's Spring.....	NW. 32-5-1-1.....	324	0.000602
Sept. 11.....	do.....	Link's Spring.....	SW. 32-5-1-4.....	1,072	0.001990
Oct. 5.....	do.....	Adam's Spring.....	NW. 32-5-1-4.....	312	0.000579
Oct. 5.....	do.....	Link's Spring.....	SW. 32-5-1-4.....	861	0.001600

## BATTLE CREEK DRAINAGE BASIN.

*General Description.*

Battle Creek rises in Township 8, Range 2, West of the 4th Meridian, and flows in an easterly direction for about eight miles, where it crosses the 4th Meridian, then turns in a southeasterly direction and crosses the international boundary at Section 3, Township 1, Range 26, West of the 3rd Meridian, eventually emptying into Milk River near Chinook, Montana.

As is characteristic of the streams in this locality, the valley is narrow and deep near the source and gradually broadens out into large flats and meadows. These large flats are first noticed in the vicinity of Battle Creek Post Office. Near the head of the stream the valley is well wooded with medium sized timber, but this diminishes to a growth of willow brush along the banks and finally disappears altogether.

The chief tributaries of Battle Creek are Tenmile Creek, joining it in Section 4, Township 6, Range 29, West of the 3rd Meridian, and Sixmile Coulee, joining it in Section 21, Township 6, Range 29, West of the 3rd Meridian. Stations have been established on both of these streams.

There are three stations on Battle Creek at the following places: Nash's ranch, Wilkes' ranch, and Tenmile Police Detachment.

Although it will be several years before it reaches its fullest development, the irrigation of the flats along the creeks is increasing every year. This, it is expected, will result in a more uniform flow in the creek, as a certain amount of the water diverted by the irrigation ditches will be returned to the creek through seepage.

## WOOD AND ANDERSON DITCH NEAR COULEE.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 21, Tp. 7, Rge. 29, W. 3rd Mer., about 150 feet west of ranch house.

*Records available.*—For the irrigation season of 1915.

*Gauge.*—Vertical staff driven into the bed of the ditch near the right bank. Zero elevation maintained at 96.80 feet, since establishment.

*Bench-mark.*—Top of wooden stake located opposite the gauge rod on the left bank. Assumed elevation, 100.00 feet.

*Artificial control.*—A permanent twenty-four inch sharp crested rectangular weir controls the flow at this station, located ten feet below the gauge. Elevation of crest maintained at 98.80 feet.

*Discharge measurements.*—Made with weir.

*Observer.*—M. D. Wood.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Wood and Anderson Ditch near Coulee, for 1915.

DAY.	May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.13 <sup>b</sup>	0.31	2.13	0.31
2.....					2.12	0.27
3.....					2.10	0.21
4.....					2.10	0.21
5.....					2.11	0.24
6.....					2.10	0.21
7.....					2.11	0.24
8.....					<sup>b</sup>	
9.....						
10.....						
11.....						
12.....						
13.....						
14.....						
15.....						
16.....						
17.....						
18.....						
19.....						
20.....						
21.....						
22.....			2.12 <sup>a</sup>	0.27		
23.....	2.20 <sup>a</sup>	0.58	2.16	0.42		
24.....	2.22	0.67	2.16	0.42		
25.....	2.19	0.54	2.14	0.34		
26.....	2.23	0.72	2.13	0.31		
27.....	2.10	0.21	2.13	0.31		
28.....	2.13	0.31	2.14	0.34		
29.....	2.24	0.76	2.13	0.31		
30.....	2.12	0.27	2.13	0.31		
31.....	2.14	0.34				

<sup>a</sup> Headgate opened.<sup>b</sup> Headgate closed.

## MONTHLY DISCHARGE of Wood and Anderson Ditch near Coulee, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May (23-31).....	0.72	0.21	0.49	9
June (1, 22-30).....	0.42	0.27	0.37	6
July (1-7).....	0.31	0.21	0.24	3
The period.....				18

## WOOD AND ANDERSON WEST DITCH NEAR COULEE.

*Location.*—On the N.E.  $\frac{1}{4}$  Sec. 22, Tp. 7, Rge. 29, W. 3rd Mer., 375 feet below intake of ditch.

*Records available.*—No water was used during irrigation seasons of 1914 and 1915.

*Gauge.*—Vertical staff driven into the bed of the ditch near the right bank. Elevation of zero maintained at 97.54 feet since establishment of station.

*Bench-mark.*—Top of wooden stake located on left bank. Assumed elevation, 100.000 feet.

*Artificial control.*—A twenty-four inch sharp crested weir controls the flow at this station and is located ten feet below the gauge rod. The elevation of the crest is maintained at 99.12 feet.

*Discharge measurements.*—Made with weir.

*Observer.*—M. D. Wood.

## WOOD AND ANDERSON EAST DITCH NEAR COULEE.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 22, Tp. 7, Rge. 29, W. 3rd Mer., about two hundred feet below dam.

*Records available.*—For the irrigation season of 1915, during which the ditch was used for two days (May 24-25) with a total flow of three acre-feet.

*Gauge.*—Vertical staff driven into the bed of the ditch near the right bank. Elevation of zero maintained at 97.16 feet since establishment.

*Bench-mark.*—Top of a wooden stake located near the weir on the left bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of clay and gravel.

*Discharge measurements.*—Made by measuring head over 36-inch sharp crested rectangular weir which is permanently located ten feet below the gauge rod.

*Artificial control.*—36-inch sharp crested, rectangular weir located ten feet below gauge. Elevation of crest of weir maintained at 98.35 feet.

*Observer.*—M. D. Wood.

*Remarks.*—This station was established June 20, 1914, by J. A. Tom. No water was used during 1914 irrigation season.

## F. L. MULL WEST DITCH NEAR COULEE.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 24, Tp. 7, Rge. 29, W. 3rd Mer., about 900 feet below dam and intake.

*Records available.*—During the irrigation season of 1915 no water was used.

*Gauge.*—Vertical staff driven into the bed of ditch near left bank. Elevation of zero of gauge maintained at 96.02 since establishment.

*Bench-mark.*—Top of iron post located on the right bank near gauge. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand and gravel.

*Discharge measurements.*—Made by measured head over permanent sharp crested weir, located 10 feet below gauge rod. Elevation of crest of weir maintained at 96.90 feet.

*Observer.*—Fred Mull.

*Remarks.*—This station was established June 9, 1915, by H. R. Carscallen.

## F. L. MULL EAST DITCH NEAR COULEE.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 24, Tp. 7, Rge. 29, W. 3rd Mer., about 800 feet below dam and intake of irrigation ditch.

*Records available.*—For the irrigation season of 1915, during which no water was used.

*Gauge.*—Vertical staff. Zero of gauge maintained at 98.53 feet since establishment.

*Bench-mark.*—Top of iron post on the right bank near gauge and ten feet upstream from permanent weir.

*Channel.*—Composed of sand and gravel.

*Discharge measurements.*—Made by measured head on permanent 24 inch weir located 10 feet below gauge rod.

*Observer.*—Fred Mull.

*Remarks.*—This station was established June 9, 1915, by H. R. Carscallen.

## J. E. PARSONAGE DITCH NEAR BATTLE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 3, Tp. 7, Rge. 29, W. 3rd Mer., about 70 feet upstream from bridge on road allowance between Townships 6 and 7, Range 29.

*Gauge.*—Vertical staff, driven into bed of ditch about ten feet upstream from permanent weir. Zero of gauge maintained at 95.86 feet.

*Bench-mark.*—Top of three-quarters inch iron post, 15 feet from gauge on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand and gravel.

*Discharge measurements.*—Made by measured head over crest of permanent sharp crested 24 inch rectangular weir. Elevation of crest of weir maintained at 96.96 feet.

*Observer.*—J. E. Parsonage.

*Remarks.*—This station was established June 9, 1915, by H. R. Carscallen. No water was used during 1915.

## SESSIONAL PAPER No. 25c

## SPANGLER DITCH FROM SIXMILE COULEE.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 6, Tp. 7, Rge. 28, W. 3rd Mer., at Spangler's ranch.

*Records available.*—For the irrigation seasons of 1912-15.

*Gauge.*—Vertical staff. Zero of gauge has been maintained at 96.57 feet since establishment.

*Bench-mark.*—The top of the I. P. stake. Assumed elevation, 100.00 feet.

*Channel.*—Composed of soft clay.

*Discharge measurements.*—Made by wading or with a weir.

*Observer.*—J. M. Spangler.

*Remarks.*—Measurements of discharge were not obtained in 1915 and the daily discharges shown are obtained by applying the 1914 curve.

## DAILY GAUGE HEIGHT AND DISCHARGE of Spangler Ditch from Sixmile Coulee, for 1915.

DAY.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....							1 45	0 64
2.....							1 40	0 40
3.....							1 35b	0 23
4.....								
5.....					1 77a	4 70		
6.....					1 75	4 40		
7.....					1 75	4 40		
8.....					1 78b	4 80		
9.....								
10.....	1 57a	1 79c						
11.....	1 56	1 67						
12.....	1 54	1 45						
13.....	1 57b	1 79						
14.....								
15.....								
16.....								
17.....								
18.....								
19.....								
20.....								
21.....								
22.....								
23.....					1 67a	3 20		
24.....					1 65	2 90		
25.....					1 63	2 60		
26.....					1 66	3 00		
27.....					1 68	3 40		
28.....					1 66	3 00		
29.....					1 66	3 00		
30.....					1 66	3 00		
31.....					1 58	1 91		

a Headgates opened.

b Headgates closed.

c No discharge measurements made in 1915. Discharges from 1914 records.

## MONTHLY DISCHARGE of Spangler Ditch from Sixmile Coulee, for 1915.

MONTH	DISCHARGE IN SECOND-Feet			Total discharge in Acre-feet
	Maximum.	Minimum.	Mean.	
May (10-13)	1 79	1 45	1 68	19
June	0 00	0 00	0 00	NIL
July (5-8, 23-31)	4 80	1 91	2 40	81
August (1-3)	0 61	0 23	0 42	7
The period				195

## SIXMILE COULEE AT SPANGLER'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  of Sec. 6, Tp. 7, Rge. 28, W. 3rd Mer., near Mr. Spangler's house. The present station is 850 feet north of the former station established July 4, 1911.

*Records available.*—At former station 850 feet downstream from July 3, 1911, to November 7, 1911; at present station April 13, 1912, to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 90.68 feet (original station), during 1911; zero of gauge maintained at 96.73 feet during 1912–15.

*Bench-mark.*—Permanent iron bench-mark located on the left bank 850 feet below gauge rod.

*Discharge measurements.*—Made by wading or with weir.

*Artificial control.*—Permanent 6 foot weir installed 175 feet below gauge, September 8, 1915, elevation of crest 98.99 feet.

*Winter flow.*—Station discontinued during winter season.

*Diversions.*—Water is diverted by J. M. Spangler for irrigation one-half mile above.

*Observer.*—D. B. Spangler.

#### DISCHARGE MEASUREMENTS of Sixmile Coulee at Spangler's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 26.....	H. R. Carscallen.....	8.2	10.8	0.78	3.45	8.50
April 2.....	do.....	8.5	8.4	1.14	2.58	9.60
April 17.....	H. W. Rowley.....	9.0	6.6	1.24	2.20	8.20
May 19.....	do.....	9.0	6.9	1.47	2.39	10.20
June 5.....	do.....	10.0	18.2	1.35	3.60	25.00
June 25.....	do.....	8.0	4.2	1.24	2.10	5.20
Aug. 4.....	do.....	7.0	4.1	0.71	2.02	2.90
Aug. 28.....	do.....	<sup>a</sup>			1.75	0.55
Sept. 18.....	do.....	6.0	2.6	1.35	2.50	3.50
Oct. 16.....	do.....	7.0	3.9	1.38	2.60	5.40
Nov. 5.....	do.....	6.0	2.8	0.82	2.43	2.30

<sup>a</sup> Weir measurement.

#### DAILY GAUGE HEIGHT AND DISCHARGE of Sixmile Creek at Spangler's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.34	3.30	1.74	2.70	2.01	5.60
2.....			2.89	11.10	1.73	2.60	2.23	8.30
3.....			4.17	32.00	1.73	2.60	2.59	12.90
4.....			3.67	23.00	1.76	2.90	3.33	20.00
5.....			4.47	38.00	1.76	2.90	3.57	24.00
6.....			4.01	30.00	1.77	3.00	4.41	41.00
7.....			3.61	24.00	1.78	3.10	4.03	34.00
8.....			3.20	17.70	1.76	2.90	3.56	24.00
9.....			2.84	13.30	1.62	1.66	3.18	18.00
10.....			2.71	12.00	1.55	1.10	2.82	12.80
11.....			2.56	10.40	1.50	0.70	2.69	11.10
12.....			2.48	9.70	1.48	0.56	2.59	9.90
13.....			2.38	8.90	1.48	0.56	2.50	8.80
14.....			2.30	8.30	1.58	1.34	2.40	7.60
15.....			2.24	7.90	2.28	8.90	2.33	6.80
16.....	1.83	3.60	2.22	8.00	3.11	20.00	2.29	6.30
17.....	1.79	3.20	2.26	8.60 <sup>b</sup>	2.94	17.60	2.32	6.60
18.....	1.69	2.20	2.14	7.20	2.53	12.10	2.28	6.20
19.....	1.64	1.82	2.11	6.80	2.38	10.10	2.26	5.90
20.....	1.65	1.90	2.09	6.60	2.28	8.90	2.31	6.50
21.....	1.99	5.40	2.05	6.10	2.20	7.90	2.27	6.00
22.....	2.19	7.80	2.03	5.90	2.14	7.29	2.19	5.10
23.....	4.61 <sup>a</sup>	25.00	2.01	5.60	2.09	6.60	2.22	5.40
24.....	3.79	12.70	2.01	5.60	2.05	6.10	2.14	4.50
25.....	2.99	3.30	1.98	5.30	2.03	5.90	2.10	4.10
26.....	3.61	10.50	1.95	5.00	2.05	6.10	2.12	4.30
27.....	2.64	1.10	1.90	4.40	2.06	6.20	2.20	5.20
28.....	2.43	0.40	1.86	4.00	2.01	5.60	2.13	4.40
29.....	2.44	1.20	1.83	3.60	2.03	5.90	2.11	4.20
30.....	2.46	2.30	1.80	3.30	2.04	6.00	2.10	4.10
31.....	2.36	2.40			1.99	5.40		

<sup>a</sup> to <sup>b</sup> Shifting ice conditions.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sixmile Creek at Spangler's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	D's-discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.08	3.90	2.06	3.70	2.34	6.90	2.47	2.90
2	2.05	3.60	2.05	3.60	2.35	7.00	2.50	3.40
3	2.02	3.20	2.05	3.60	2.58	9.80	2.55	4.40
4	1.98	2.80	2.00	3.00	2.55	9.40	2.62	5.80
5	1.90	1.90	1.99	2.90	2.50	8.80	2.60	5.40
6	1.85	1.40	1.95	2.40	2.46	8.30	2.61	5.60
7	1.80	0.90	1.93	2.20	2.43	8.00	2.62	5.80
8	2.20	5.20	1.90	1.90	2.50	3.40	2.61	5.60
9	2.15	4.60	1.85	1.40	2.50	3.40	2.60	5.40
10	2.10	4.10	1.80	0.90	2.51	3.60	2.61	5.60
11	2.05	3.60	1.75	0.60	2.53	4.00	2.62	5.80
12	1.93	2.20	1.70	0.30	2.54	4.20	2.68	7.20
13	2.05	3.60	1.62	0.06	2.55	4.40	2.65	6.50
14	2.40	7.60	1.65	0.15	2.58	5.00	2.61	5.60
15	2.45	8.20	1.68	0.24	2.56	4.60	2.60	5.40
16	2.43	8.00	1.70	0.30	2.53	4.00	2.58	5.00
17	2.55	9.40	1.70	0.30	2.51	3.60	2.59	5.20
18	2.92	14.20	1.68	0.24	2.50	3.40	2.58	5.00
19	3.00	15.30	1.80	0.90	2.50	3.40	2.55	4.40
20	2.67	10.80	1.95	2.40	2.55	4.40	2.55	4.40
21	2.48	8.60	1.90	1.90	2.52	3.80	2.54	4.20
22	2.38	7.40	1.88	1.70	2.51	3.60	2.52	3.80
23	2.20	5.20	1.87	1.60	2.50	3.40	2.51	3.60
24	2.20	5.20	1.85	1.40	2.50	3.40	2.50	3.40
25	2.21	5.30	1.83a	1.26	2.49	3.20	2.52	3.80
26	2.26	5.90	1.82a	1.10	2.47	2.90	2.55	4.40
27	2.22	5.40	1.80	0.90	2.47	2.90	2.53	4.00
28	2.19	5.10	1.75	0.60	2.46	2.80	2.50	3.40
29	2.15	4.60	2.30	6.40	2.46	2.80	2.50	3.40
30	2.11	4.20	2.32	6.60	2.47	2.90	2.48	3.10
31	2.07	3.80	2.34	6.90			2.47	2.90

a Gauge height interpolated.

## MONTHLY DISCHARGE of Sixmile Creek at Spangler's Ranch, for 1915.

(Drainage area 42 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (16-31)	25.0	0.40	5.3	0.1260	0.07	169
April	38.0	3.30	22.0	0.5240	0.58	1309
May	20.0	0.56	5.6	0.1330	0.15	343
June	41.0	4.10	10.8	0.2570	0.29	643
July	15.3	0.90	5.6	0.1330	0.15	344
August	6.9	0.06	2.0	0.0476	0.05	123
September	9.8	2.80	4.7	0.1120	0.12	283
October	7.2	2.90	4.7	0.1120	0.13	289
The period					1.54	3501

## LINDNER DITCH FROM BATTLE CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 16, Tp. 6, Rge. 29, W. 3rd Mer., near Tennile Police Detachment.*Records available.*—For the irrigation season of 1910-15.*Gauge.*—Vertical staff. Zero maintained at 90.36 feet during 1915.*Bench-mark.*—A permanent iron bench-mark was located near intake headgate. Assumed elevation, 100.00 feet.*Channel.*—Composed of gravel and clay loam.



*Discharge measurements.*—Made with a 42-inch weir which is permanently installed in the ditch.

*Observer.*—J. B. Lindner.

*Remarks.*—This is a weir station, consisting of a 42-inch sharp crested weir with complete end contractions. The elevation of the crest of the weir was kept at a gauge height of 1.04 feet during 1914-15.

DISCHARGE MEASUREMENTS of Lindner Ditch from Battle Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 8.....	H. W. Rowley.....	a			1.71	6.30
July 10.....	do				Dry.	Nil.

DAILY GAUGE HEIGHT AND DISCHARGE of Lindner Ditch from Battle Creek, for 1915.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....							1.70	6.00
2.....							1.70	6.00
3.....							1.70	6.00
4.....							1.60	4.70
5.....							1.60	4.70
6.....							1.60	4.70
7.....							1.60	4.70
8.....							1.60	4.70
9.....							1.60b	4.70
10.....								
11.....								
12.....	1.41a	2.60						
13.....	1.76	6.80						
14.....	1.76	6.80						
15.....	1.76	6.80						
16.....	1.76	6.80						
17.....	1.76	6.80						
18.....	1.76	6.80						
19.....	1.76	6.80						
20.....	1.61	4.90						
21.....	1.61	4.90						
22.....	1.61	4.90						
23.....	1.61b	4.90						
24.....								
25.....								
26.....								
27.....								
28.....								
29.....					1.70a	6.00		
30.....					1.70	6.00		
31.....								

a Headgate opened.

b Headgate closed.

MONTHLY DISCHARGE of Lindner Ditch from Battle Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-Feet.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (12-23).....	6.80	2.60	5.80	139
June (29-30).....	6.00	6.00	6.00	24
July (1-8).....	6.00	4.70	5.20	83
The period.....				246

## SESSIONAL PAPER No. 25c

## TENMILE CREEK AT TENMILE POLICE DETACHMENT.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 4, Tp. 6, Rge. 29, W. 3rd Mer., near the Tenmile Police Detachment.

*Records available.*—July 21, 1909, to October 31, 1914, and for March and April, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 93.38 feet during 1909–11; zero of gauge maintained at 91.72 feet during 1912; zero of gauge maintained at 89.24 feet during 1913; zero of gauge maintained at 90.83 feet from March 15 to September 14, 1914; zero of gauge (temporary station) maintained at 99.76 feet from September 14, to October 31, 1914; zero of gauge maintained at 90.83 feet during 1915.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Practically permanent.

*Discharge measurements.*—Made by wading or with weir.

*Winter flow.*—Station discontinued during winter season.

*Artificial control.*—The beaver dam in Battle Creek which affected the gauge heights at this station during the latter part of 1914 season was destroyed by the police during winter of 1914–15.

*Observer.*—W. H. Tudgay.

## DISCHARGE MEASUREMENTS of Tenmile Creek at Tenmile Police Detachment, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 25.....	H. R. Carscallen.....	8.5	12.0	1.51	2.34	15.20
Mar. 30.....	do.....	4.0	3.6	1.11	1.86	3.90
April 3.....	do.....	19.5	23.0	1.61	2.85	37.00
April 10.....	do.....	4.4	2.1	0.38	1.63	0.80
April 13.....	H. W. Rowley.....	a			1.58	0.15

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Tenmile Creek at Tenmile Police Detachment, for 1915.

DAY.	March.		April.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.82	3.30
2.....			2.25	14.90
3.....			2.80	35.00
4.....			3.17	50.00
5.....			3.26	53.00
6.....			2.27	14.20
7.....			1.86	4.00
8.....			1.78	2.20
9.....			1.67	1.17
10.....			1.61	0.51
11.....			1.60	0.40
12.....			1.61	0.51
13.....			1.59	0.34
14.....			1.59	0.30
15.....			1.58	0.32
16.....			1.58	0.32
17.....			1.58	0.32
18.....			1.58	0.32
19.....			1.58	0.32
20.....			1.58	0.32
21.....			1.58	0.32
22.....			1.18	0.32
23.....	4.32	96.00	1.58	0.32
24.....	3.50	71.00	1.58	0.32
25.....	2.55	26.00	1.58	0.32
26.....	2.36	18.90	1.58	0.32
27.....	2.15	11.40	1.58	0.32
28.....	2.08	9.20	1.58	0.32
29.....	2.02	7.90	1.58	0.32
30.....	1.97	6.80	1.58	0.32
31.....	1.88	4.80	1.58	0.32
	1.75	2.20		

## MONTHLY DISCHARGE of Tenmile Creek at Tenmile Police Detachment, for 1915.

(Drainage area 24 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	96.0	2.20	25.0	1.042	0.39	500.0
April.....	53.0	0.32	6.2	.258	0.29	369.0
The period.....					0.68	869.0

## BATTLE CREEK AT TENMILE POLICE DETACHMENT.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., at the Highway bridge, about one-quarter mile south of Tenmile Police Detachment and 300 yards north of the new Battle Creek Post Office.

*Records available.*—From June 3, 1909, to October 31, 1915.

*Gauge.*—Chain gauge fastened to the guard rail, on the downstream side of bridge. Zero of gauge maintained at 86.97 feet, length of chain (from marker to bottom of weight) 19.10 feet, during 1909-10; zero of gauge maintained at 86.87 feet, length of chain, 19.10 feet, during 1911; zero of gauge maintained at 86.84 feet, length of chain, 19.11 feet, during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Practically permanent, but might shift during extreme floods. Weeds in the channel affect the gauge heights at times, during mid-summer season.

*Discharge measurements.*—Made from downstream side of bridge during high water and by wading or with weir some distance below during low water flow.

*Winter flow.*—Station discontinued during winter season.

*Artificial control.*—There are several large beaver dams above this station which have a tendency to keep the creek running at this point after the creek goes dry farther up towards its source in the Cypress Hills.

*Diversions.*—Lindner Brothers divert water for irrigation, about two miles above.

*Observer.*—W. H. Tudgay, March to June 5; Frank S. Ball, June 6 to August 22, and Tom Bell, August 23 to October 31.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Battle Creek at Tenmile Police Detachment, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 15.....	H. R. Carscallen.....	23.0	40.0	0.34	2.85	13.7
Mar. 17.....	do.....	23.0	51.0	0.36	3.00	18.3
Mar. 22.....	do.....	35.0	113.0	0.65	4.78	74.0
Mar. 23.....	do.....	40.5	149.0	1.38	5.64	205.0
Mar. 24.....	do.....	34.5	117.0	1.03	4.79	120.0
Mar. 25.....	do.....	32.5	92.0	0.61	4.00	56.0
Mar. 27.....	do.....	32.0	78.0	0.59	3.64	46.0
Mar. 30.....	do.....	32.5	26.0	1.34	3.04	35.0
April 1.....	do.....	35.0	30.0	1.18	3.06	36.0
April 2.....	do.....	39.6	41.0	1.44	3.44	58.0
April 3.....	do.....	43.0	186.0	1.68	6.40	312.0
April 4.....	do.....	57.0	289.0	2.04	8.47	588.0
April 9.....	do.....	32.5	88.0	1.13	3.94	98.0
April 13.....	H. W. Rowley.....	34.0	32.1	1.91	3.37	61.0
April 22.....	do.....	30.5	23.8	1.58	3.04	38.0
April 27.....	do.....	28.0	21.8	1.56	2.97	33.0
May 8.....	do.....	25.5	18.0	1.39	2.82	25.0
May 25.....	do.....	31.0	29.5	1.48	3.19	44.0
June 3.....	do.....	47.0	85.0	1.65	4.54	140.0
June 4.....	do.....	40.0	158.0	1.50	5.74	237.0
June 21.....	do.....	35.0	33.4	1.54	3.33	51.0
July 10.....	do.....	31.0	27.0	1.30	3.13	35.0
July 30.....	do.....	33.0	29.5	1.23	3.22	36.0
Aug. 16.....	do.....	28.0	18.4	0.80	2.67	14.6
Sept. 7.....	do.....	31.0	24.6	1.05	3.10	26.0
Oct. 4.....	do.....	36.0	33.8	1.22	3.36	41.0
Oct. 27.....	do.....	31.0	25.1	1.20	3.08	30.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Battle Creek at Tenmile Police Detachment, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.08	38	2.89	28.0	2.93	31
2.....			3.80	80	2.88	28.0	3.44	58
3.....			7.13	407	2.87	28.0	4.36	120
4.....			8.46	587	2.87	28.0	5.20	191
5.....			8.23	555	2.85	26.0	6.01	270
6.....			5.75	344	2.82	25.0	5.93	262
7.....			4.68	145	2.82	25.0	4.96	169
8.....			4.18	107	2.84	26.0	4.40	123
9.....			3.94	90	2.72	20.0	4.05	98
10.....			3.68	73	2.68	18.2	3.88	86
11.....			3.55	65	2.65	17.0	3.79	79
12.....			3.49	61	2.60	15.0	3.69	73
13.....			3.37	54	2.61	15.4	3.56	66
14.....			3.40	58	2.84	26.0	3.51	63
15.....			3.40	56	3.30	50.0	3.42	57
16.....	3.33a	29	3.30	50	4.43	125.0	3.32	51
17.....	3.00	19	3.23	46	4.01	95.0	3.37	54
18.....	3.00	19	3.20	44	3.72	75.0	3.41	57
19.....	2.80	12	3.13	41	3.52	63.0	3.33	52
20.....	2.87	13	3.05	36	3.39	55.0	3.37	54
21.....	3.17	24	3.07	38	3.28	49.0	3.33	53
22.....	5.98	164	3.05	36	3.21	45.0	3.28	45
23.....	5.58	200	3.02	35	3.14	41.0	3.14	40
24.....	4.65	110	3.08	38	3.10	39.0	3.34	51
25.....	3.96	54	3.05	36	3.07	38.0	3.31	49
26.....	4.00	62	3.02	35	3.19	43.0	3.28	47
27.....	3.76	54	3.00	34	3.15	41.0	3.37	52
28.....	3.55	48	2.98	33	3.08	38.0	3.23	44
29.....	3.46	48	2.96	32	3.04	36.0	3.19	42
30.....	3.22b	45	2.95	31	3.00	34.0	3.00	31
31.....	3.12	40			2.97	33.0		

a to b Shifting conditions.

c to d Shifting conditions

DAILY GAUGE HEIGHT AND DISCHARGE of Battle Creek at Tenmile Police Detachment for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.99	30	3.17	34	2.85	16	3.05	25
2.	3.19	41	3.14	33	2.90	18	3.05	25
3.	3.09	35	3.10	32	3.01	24	3.26	35
4.	3.00	30	3.05	29	3.10	27	3.36	41
5.	2.95	27	3.05	28	3.15	29	3.36	41
6.	2.94	26	3.01	28	3.05	24	3.38	43
7.	2.90	24	2.96	26	3.10	26	3.36	41
8.	3.04	21	2.95	26	3.10	26	3.38	43
9.	3.18	38	2.91	24	3.14	28	3.37	42
10.	3.15	35	2.91	24	3.14	28	3.40	44
11.	3.10	33	2.86	22	3.18	30	3.40	44
12.	3.00	28	2.86	22	3.15	29	3.38	44
13.	2.95	25	2.86	22	3.28	36	3.37	43
14.	4.50	120	2.85	22	3.35	39	3.36	43
15.	4.16	96	2.90	25	3.35	40	3.36	43
16.	3.70	66	2.70	16	3.36	40	3.34	42
17.	3.65	63	2.86	23	3.35	40	3.34	42
18.	3.79	71	3.33	46	3.30	37	3.36	44
19.	3.70	66	3.33	46	3.30	37	3.35	44
20.	3.56	57	3.33	46	3.25	35	3.35	43
21.	3.46	51	3.26	42	3.25	34	3.36	44
22.	3.37	46	3.18	37	3.23	33	3.33	43
23.	3.28	40	3.00	27	3.20	32	3.30	41
24.	3.42	48	2.95	24	3.18	31	3.28	40
25.	3.38	45	2.95	24	3.18	31	3.28	40
26.	3.32	42	2.91	22	3.15	30	3.28	40
27.	3.27	40	2.85	18	3.10	28	3.19	36
28.	3.23	37	2.90	20	3.00	23	3.08	30
29.	3.18	34	2.85	18	3.00	22	3.04	28
30.	3.22	36	2.86	18	3.05	25	3.02	27
31.	3.22	36	2.85	17	.....	.....	3.00d	26

c-d Shifting conditions.

MONTHLY DISCHARGE of Battle Creek at Tenmile Police Detachment, for 1915.

(Drainage area 210 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March <sub>1</sub> (16-31)	200	12	59	0.281	0.17	1,866
April	587	31	109	0.519	0.58	6,486
May	125	15	40	0.190	0.22	2,460
June	270	31	82	0.391	0.44	4,891
July	120	24	45	0.214	0.25	2,767
August	46	16	27	0.129	0.15	1,660
September	40	16	30	0.143	0.16	1,785
October	44	25	39	0.186	0.21	2,398
The period	.....	.....	.....	.....	2.18	24,313

## SESSIONAL PAPER No. 25c

## MARSHALL AND GAFF DITCH FROM BATTLE CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., about two hundred and fifty feet below headgate of ditch.

*Records available.*—During the irrigation season of 1914 and 1915 no water was used by Mrs. Marshall and no daily gauge height records were kept. Records at a point three miles below are given under Gaff Ditch.

*Gauge.*—Vertical staff driven into the bed of the ditch near the right bank. Elevation of zero maintained at 95.02 feet during 1915.

*Bench-mark.*—Permanent iron bench-mark located near the log control on the left bank. Assumed elevation, 100.00 feet.

*Artificial control.*—A permanent log control was constructed August 9, 1915, fifty feet below the gauge rod.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Mrs. L. A. Marshall.

## GAFF DITCH FROM BATTLE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 25, Tp. 5, Rge. 29, W. 3rd Mer.

*Records available.*—For the irrigation seasons of 1912–15.

*Gauge.*—Vertical staff. The zero of the gauge was maintained at 96.18 feet during 1912 to October 2, 1915. On October 2 a new standard gauge was installed, the zero datum of which is 95.95 feet.

*Bench-mark.*—A permanent iron rod bench-mark was set on June 25, 1915, on the section line between Secs. 25 and 26, about 20 feet north of the ditch. Elevation assumed, 100.00 feet, elevation of old bench-mark stake as referred to iron bench-mark, 99.22 feet.

*Channel.*—Composed of sandy loam.

*Discharge measurements.*—Made with meter by wading or with a weir.

*Artificial control.*—A log control was built 20 feet below the gauge on October 2, 1915.

*Observer.*—W. D. Gaff.

## DISCHARGE MEASUREMENTS of Gaff Ditch from Battle Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 7	H. W. Rowley	7	8.6	1.06	1.54	9.1
June 25	do				Dry.	Nil.
Aug. 6	do				"	"
Oct. 2	do				"	"
Oct. 20	do	9	10.4	0.62	2.03	6.5

## DAILY GAUGE HEIGHT AND DISCHARGE of Gaff Ditch from Battle Creek, for 1915.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.83	13.50
2.....			1.92 <sup>b</sup>	14.80
3.....				
4.....	1.58 <sup>a</sup>	10.0		
5.....	1.50	9.0		
6.....	1.50	9.0		
7.....	1.58	10.0		
8.....	1.58	10.0		
9.....	1.50	9.0		
10.....	1.42	8.0		
11.....	1.50	9.0		
12.....	1.50	9.0		
13.....	1.42	8.0		
14.....	2.00 <sup>b</sup>	16.1		
15.....				
16.....				
17.....				
18.....				
19.....				
20.....				
21.....				
22.....	1.58 <sup>a</sup>	10.0		
23.....	1.58	10.0		
24.....	1.58	10.0		
25.....	1.58	10.0		
26.....	1.92	14.8		
27.....	1.92	14.8		
28.....	1.92	14.8		
29.....	1.92	14.8		
30.....	1.83	13.5		
31.....	1.83	13.5		

<sup>a</sup> Headgate opened.<sup>b</sup> Headgate closed.

## MONTHLY DISCHARGE of Gaff Ditch from Battle Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May <sup>a</sup> .....	16.10	8.00	11.10	462
June <sup>b</sup> .....	14.80	13.50	14.00	56
The period.....				518

<sup>a</sup> Water diverted May 4-14, May 22-31.<sup>b</sup> Water diverted June 1-2.



## SESSIONAL PAPER No. 25c

## F. W. HENRY DITCH FROM BATTLE CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 28, Tp. 5, Rge. 28, W. 3rd Mer., near Battle Creek.

*Records available.*—For the irrigation season of 1915.

*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 97.97 feet during 1915.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of Gumbo.

*Discharge measurements.*—Made with a 5-foot sharp crested weir permanently located 20 feet below the gauge elevation of crest 98.52 feet.

*Observer.*—F. W. Henry.

*Remarks.*—This ditch was used for irrigation purposes for five days during April, but as the weir was not installed until October, sufficient data were not obtained to compute the discharge. The estimated discharge is 26 acre-feet.

## DISCHARGE MEASUREMENTS of Henry Ditch from Battle Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 7.....	H. W. Rowley.....	6.2	3.7	1.02	0.61	3.8
June 25.....	do.....				Dry.	Nil.
Aug. 6.....	do.....				"	"
Sept. 4.....	do.....				"	"
Sept. 22.....	do.....				"	"
Oct. 20.....	do.....				"	"

## DAILY GAUGE HEIGHT AND DISCHARGE of Henry Ditch from Battle Creek, for 1915.

DAY.	May.	
	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		
2.....		
3.....		
4.....		
5.....		
6.....		
7.....		
8.....	0.61	3.80
9.....	0.68	4.40
10.....	0.66	4.20
11.....	0.65	4.10
12.....		
13.....	0.64	4.00
14.....	0.36	1.70
15.....	0.37	1.78
16.....	0.39	1.94
17.....		
18.....		
19.....		
20.....		
21.....		
22.....		
23.....		
24.....		
25.....		
26.....		
27.....		
28.....		
29.....		
30.....		
31.....		

## MONTHLY DISCHARGE of Henry Ditch from Battle Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May (7-14).....	4.4	1.7	3.2	51

## HENRY DITCH FROM HALFWAY COULEE.

*Location.*—On NW.  $\frac{1}{4}$  Sec. 34, Tp. 5, Rge. 28, W. 3rd Mer., near Battle Creek.

*Records available.*—For the irrigation season of 1915.

*Gauge.*—Vertical staff.

*Discharge measurements.*—Made with a 24-inch sharp crested rectangular weir, permanently set in the ditch 10 feet below the gauge rod.

*Observer.*—F. W. Henry.

*Remarks.*—The zero flow gauge height was 1.17 feet during 1915. The ditch was used for eight days in May, during which period a total of 15 acre-feet was used.

## WILSON DITCH FROM BATTLE CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 34, Tp. 5, Rge. 28, W. 3rd Meridian.

*Records available.*—Discharge measurements only in 1914. No water used during 1915.

*Gauge.*—Plain staff. Zero elevation, 96.28 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on left bank. Assumed elevation, 100.00 feet.

## BATTLE CREEK AT WILKES' RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 33, Tp. 5, Rge. 27, W. 3rd Mer., at R. W. Wilkes' ranch, twelve miles east of the Tenmile Police Detachment.

*Records available.*—From May 1, 1912, to October 31, 1915. From July 5, 1910, to November 7, 1911, a station was maintained at W. S. Wilson's ranch, six miles above.

*Gauge.*—Vertical staff. Zero of gauge maintained at 89.86 feet during 1912; zero of gauge maintained at 90.01 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet, located on the left bank 750 feet below the gauge.

*Channel.*—Composed of sand and slightly shifting.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Station discontinued during winter season.

*Diversions.*—Water is diverted above this station for irrigation purposes, by Mrs. L. A. Marshall, J. A. Gaff, Lindner Brothers, W. S. Wilson and F. W. Henry.

*Observer.*—Mrs. Bertha Wilkes.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Battle Creek at Wilkes' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 6.....	H. R. Carscallen.....	68.0	186.0	1.97	4.70	368.0
April 7.....	do.....	64.5	130.0	1.90	4.06	248.0
April 22.....	H. W. Rowley.....	37.0	33.4	1.29	2.29	43.0
May 7.....	do.....	37.0	19.0	0.83	1.83	15.8
June 5.....	do.....	36.0	118.0	2.34	3.98	277.0
June 25.....	do.....	37.0	40.6	1.37	2.24	55.0
Aug. 5.....	do.....	25.0	17.4	1.86	2.01	32.0
Sept. 4.....	do.....	25.0	16.8	1.86	1.93	31.0
Sept. 23.....	do.....	37.0	35.0	0.81	1.95	28.0
Oct. 20.....	do.....	24.0	15.6	1.89	1.85	30.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Battle Creek at Wilkes' Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			4.95	419	2.07	28.0	1.89	18.5
2.....			5.16	461	2.07	28.0	2.17	34.0
3.....			5.60	549	2.03	26.0	2.24	39.0
4.....			5.78	585	1.99	23.0	3.49	169.0
5.....			5.20	469	1.92	20.0	3.99	278.0
6.....			4.70	369	1.80	14.0	4.24	318.0
7.....			4.06	248	1.83	15.5	4.44	350.0
8.....			4.94	417	1.85	16.5	4.37	339.0
9.....			3.83	215	1.91	19.5	4.29	326.0
10.....			2.97	107	1.96	22.0	4.04	286.0
11.....			2.87	96	1.99	24.0	3.67	231.0
12.....			2.83	91	2.04	26.0	3.34	185.0
13.....			2.65	73	2.06	28.0	2.70	104.0
14.....			2.58	67	2.19	35.0	2.79	115.0
15.....			2.55	64	2.57	66.0	2.47	78.0
16.....			2.55	64	3.87	221.0	2.47	78.0
17.....			2.43	54	2.95	105.0	2.45	76.0
18.....			2.49	59	2.91	100.0	2.45	76.0
19.....			2.47	57	2.74	82.0	2.47	78.0
20.....			2.37	49	2.49	59.0	2.49	80.0
21.....	4.90a		2.31	44	2.39	50.0	2.42	72.0
22.....	5.42		2.27	41	2.37	49.0	2.35	65.0
23.....	6.51		2.28	42	2.27	41.0	2.30	60.0
24.....	8.16		2.25	40	2.15	38.0	2.32	62.0
25.....	7.95		2.22	37	2.07	28.0	2.32	62.0
26.....	7.59		2.20	36	2.09	29.0	2.28	58.0
27.....	6.96		2.15	33	2.09	29.0	2.27	57.0
28.....	5.46		2.12	31	2.02	25.0	2.25	55.0
29.....	5.38		2.07	28	1.96	24.0	2.25	55.0
30.....	5.40		2.06	28	1.93	21.0	2.23	54.0
31.....	5.20b				1.93	21.0		

a-b Gauge heights affected by ice-jam; insufficient data to compute discharge.

DAILY GAUGE HEIGHT AND DISCHARGE of Battle Creek at Wilkes' Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.30	60	2.16	48.0	1.72	17.2	2.04	38
2.....	2.28	58	2.16	48.0	1.77	20.0	2.04	38
3.....	2.30	58	2.08	41.0	1.85	25.0	2.04	38
4.....	2.42	72	2.05	39.0	1.92	29.0	2.05	39
5.....	2.50	81	2.01	36.0	1.93	30.0	2.05	39
6.....	2.48	79	2.00	35.0	1.68	15.2	2.07	41
7.....	2.42	72	1.96	32.0	1.68	15.2	2.07	41
8.....	2.35	65	1.89	27.0	1.75	19.0	2.07	41
9.....	2.26	56	1.89	27.0	1.76	20.0	2.07	41
10.....	2.18	49	1.89	27.0	1.80	22.0	2.07	41
11.....	2.11	44	1.90	28.0	1.82	23.0	2.08	41
12.....	2.74	109	1.91	29.0	1.87	26.0	2.08	41
13.....	2.47	78	1.97	33.0	1.87	26.0	2.08	41
14.....	2.79	115	1.98	34.0	1.93	30.0	2.05	39
15.....	2.97	136	2.04	38.0	1.93	30.0	2.02	37
16.....	2.96	135	2.08	41.0	1.95	32.0	2.02	37
17.....	2.82	118	2.08	41.0	1.95	32.0	2.01	36
18.....	2.87	124	2.09	42.0	1.99	34.0	1.98	34
19.....	2.61	93	2.19	50.0	2.01	36.0	1.93	30
20.....	2.44	74	2.27	57.0	2.01	36.0	1.87	26
21.....	2.42	72	2.30	60.0	2.00	35.0	1.87	26
22.....	2.33	63	2.25	55.0	1.98	34.0	1.87	26
23.....	2.28	58	2.13	45.0	1.96	32.0	1.91	29
24.....	2.23	54	2.05	39.0	1.96	32.0	1.93	30
25.....	2.23	54	1.94	31.0	1.96	32.0	1.95	32
26.....	2.23	54	1.80	22.0	1.97	33.0	1.98	34
27.....	2.23	54	1.76	20.0	1.98	34.0	1.98	34
28.....	2.25	55	1.72	17.2	1.98	34.0	2.05	39
29.....	2.26	56	1.72	17.2	1.98	34.0	2.05	39
30.....	2.28	58	1.72	17.2	2.01	36.0	2.10	43
31.....	2.22	53	1.72	17.2	.....	.....	2.11	44

## MONTHLY DISCHARGE of Battle Creek at Wilkes' Ranch, for 1915.

(Drainage area 310 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31).....	.....	.....	99	0.318	0.18	2,159 <sup>a</sup>
April.....	585	28.0	162	0.523	0.58	9,640
May.....	221	14.0	42	0.136	0.16	2,582
June.....	350	18.5	129	0.416	0.46	7,676
July.....	136	44.0	74	0.240	0.28	4,550
August.....	60	17.2	35	0.113	0.13	2,152
September.....	36	15.2	28	0.090	0.10	1,666
October.....	44	26.0	37	0.119	0.14	2,275
The period.....	.....	.....	.....	.....	2.03	32,700

<sup>a</sup> Records for March are estimates made from other stations on this stream.

# BATTLE CREEK DRAINAGE BASIN

SESSIONAL PAPER No. 25c

## GILCHRIST BROTHERS DITCH FROM BATTLE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 11, Tp. 5, Rge. 27, W. 3rd Mer., at the intake of Gilchrist Brothers' ditch near Consul.

*Records available.*—For the irrigation season of 1914. No water used in 1915.

*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 95.81 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark, located in the right bank near the gauge. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made with a meter in the flume, or with a weir just below the flume.

*Observer.*—W. F. Gilchrist.

## RICHARDSON DITCH FROM BATTLE CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 2, Tp. 5, Rge. 27, W. 3rd Mer., near Consul.

*Records available.*—October 14, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 97.03 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark located on the left bank of the ditch at the gauge rod. Assumed elevation, 106.00 feet.

*Channel.*—Composed of clay loam and overgrown with grass.

*Discharge measurements.*—Made by wading or with a weir. During 1915 all discharge measurements were nil flow.

*Observer.*—L. E. Richardson.

*Remarks.*—This ditch was used for sixteen days in April and May but insufficient data were obtained to estimate the discharge.

GAUGE HEIGHT in feet of Richardson Ditch from Battle Creek, for 1915.

DAY.	April.		May.	
	Gauge Height.		Gauge Height.	
	<i>Feet.</i>		<i>Feet.</i>	
1			0.58	
2			0.58	
3				
4				
5				
6				
7				
8				
9	0.62			
10	0.62			
11	0.62			
12	0.62			
13	0.62			
14	0.62			
15	0.42			
16	0.62			
17	0.62			
18	0.33			
19				
20				
21				
22				
23				
24				
25				
26				
27	0.58			
28	0.58			
29	0.58			
30	0.58			
31				

## J. MCKINNON DITCH FROM BATTLE CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 20, Tp. 4, Rge. 26, W. 3rd Mer., near Consul.

*Records available.*—No water has been used since station was established.

*Gauge.*—Vertical staff driven into bed of ditch near the left bank. Elevation of zero maintained at 96.07 feet during 1915.

*Bench-mark.*—During 1915 a permanent iron bench-mark was installed two feet east of the old wooden bench-mark. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made with meter or weir.

*Artificial control.*—The lateral gate near the station will affect the flow at the gauge.

*Observer.*—James McKinnon.

## STIRLING AND NASH DITCH FROM BATTLE CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 22, Tp. 3, Rge. 27, W. 3rd Mer., at R. J. Stirling's ranch, near Consul.

*Records available.*—This station was established July 11, 1911. The ditch was used from July 11 to August 17, 1911, from July 3 to August 20, 1912, and from June 28 to July 19, 1913. But sufficient discharge measurements were not made during 1911–13 to estimate the daily discharge; the only daily discharge records available are for 1914 and 1915.

*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 94.43 feet since establishment.

*Bench-mark.*—A permanent iron bench-mark on the right bank. Assumed elevation, 100.00 feet.

*Channel.*—Uniform and in good condition.

*Discharge measurements.*—Made by wading or with a weir.

*Artificial control.*—On May 21 a control was constructed thirty feet below the gauge consisting of plank piling, driven, end to end, at right angles to ditch, with surface outline about eight inches above contour of ditch.

*Observer.*—R. J. Stirling.

DISCHARGE MEASUREMENTS of Stirling and Nash Ditch from Battle Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 23.....	H. W. Rowley.....	8.0	5.00	0.69	1.25	3.50
May 21.....	do.....	<sup>a</sup>			1.00	Nil.
June 23.....	do.....	10.1	9.75	0.41	1.76	4.00
Aug. 14.....	do.....				Dry.	Nil.
Sept. 4.....	do.....				"	"
Sept. 24.....	do.....				"	"
Oct. 21.....	do.....				"	"

<sup>a</sup> Artificial control installed May 21. Zero flow gauge height, 1.00 feet.

## SESSIONAL PAPER NO. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sterling and Nash Ditch from Battle Creek, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.45	6.40	1.41	1.56
2			1.45	6.40	1.41	1.56
3			1.47	6.80	1.40	1.50
4			1.38	5.20	1.39	1.36
5			1.32	4.40	1.39	1.36
6			1.30	4.10	1.39	1.36
7			1.30	4.10	1.39	1.36
8			1.38	5.20	1.39	1.36
9			1.48	6.90	1.39	1.36
10			1.52	7.70	1.48	1.98
11			1.54	8.10	1.68	3.30
12			1.55	8.30	1.83	4.60
13			1.55	8.30	1.84	4.70
14			1.60	9.30	1.84	4.70
15			1.32	4.40	1.79	4.20
16			1.12	2.30	1.71	3.60
17			0.85	0.82	1.64	3.00
18	0.70 <sup>a</sup>	0.40	0.60	0.25	1.61	2.80
19	1.30	4.10	0.30	0.00	1.78	4.10
20	1.45	6.40	0.30	0.00	1.80	4.30
21	1.45	6.40	1.20 <sup>b</sup>	0.50	1.80	4.30
22	1.45	6.40	1.28	0.86	1.79	4.20
23	1.45	6.40	1.36	1.22	1.76	4.00
24	1.45	6.40	1.39	1.36	1.55	2.40
25	1.45	6.40	1.39	1.36	1.38	1.31
26	1.45	6.40	1.39	1.36	1.25	0.72
27	1.45	6.40	1.39	1.36	1.09	0.18
28	1.45	6.40	1.39	1.36	1.05	0.10
29	1.45	6.40	1.39	1.36	1.03	0.06
30	1.45	6.40	1.39	1.36	1.02	0.04
31			1.39	1.36		

<sup>a</sup> Headgate opened.<sup>b</sup> New control.

## MONTHLY DISCHARGE of Stirling and Nash Ditch from Battle Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (18-30)	6.40	0.40	5.50	149
May	9.30	0.00	3.60	222
June	4.70	0.04	2.40	141
The period				512

No water used after June 30th.

## BATTLE CREEK AT NASH'S RANCH.

Location.—On the NE.  $\frac{1}{4}$  Sec. 3, Tp. 3, Rge. 27, W. 3rd Mer., at E. R. Nash's ranch (Nashlyn Post Office).

Records available.—May 11, 1910, to October 31, 1915.

Gauge.—Vertical staff. Elevation of zero maintained at 90.23 feet since establishment.

Bench-mark.—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

Channel.—Slightly shifting.



*Discharge measurements.*—Made from cable car, by wading or with weir.

*Winter flow.*—Station discontinued during winter season.

*Diversions.*—Water is diverted for irrigation by Jas. McKinnon, Jr., Mrs. S. J. Richardson, Gilchrist Brothers, Stirling and Nash, and L. E. Richardson, between this station and the station at Wilkes' ranch.

*Observer.*—E. R. Nash.

### DISCHARGE MEASUREMENTS of Battle Creek at Nash's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 18.....	H. W. Rowley.....	55	19.5	0.52	2.66a	10.1
Mar. 26.....	do.....	65	166.0	1.14	5.51a	189.0
Mar. 30.....	do.....	60	156.0	0.80	4.90a	124.0
April 2.....	do.....	65	268.0	2.65	5.76	714.0
April 3.....	do.....	74	308.0	2.59	6.30	798.0
April 6.....	do.....	60	229.0	3.26	5.94	746.0
April 10.....	do.....	36	65.0	2.31	2.36	152.0
April 23.....	do.....	37	33.0	1.40	1.12	45.0
May 21.....	do.....	40	45.6	1.47	1.46	67.0
June 23.....	do.....	37	37.5	1.39	1.21	52.0
July 18.....	do.....	35	53.2	2.06	1.76	109.0
Aug. 14.....	do.....	30	17.8	0.83	0.71	14.8
Sept. 4.....	do.....	32	23.4	0.96	0.80	23.0
Sept. 24.....	do.....	32	26.4	1.04	0.88	27.0
Oct. 21.....	do.....	33	27.0	0.96	0.85	26.0

a Gauge height affected by ice.

### DAILY GAUGE HEIGHT AND DISCHARGE of Battle Creek at Nash's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			5.60b	535	0.94	31.0	0.85	25
2.....			7.75	976	0.93	30.0	0.94	31
3.....			6.19	793	0.90	28.0	0.95	32
4.....			5.44	652	0.87	26.0	1.62	90
5.....			6.06	768	0.90	28.0	1.95	123
6.....			5.91	740	0.87	26.0	3.08	261
7.....			4.57	501	0.67	14.5	3.15	272
8.....			3.24	285	0.64	13.0	2.84	228
9.....			2.68	207	0.54	8.6	2.42	174
10.....			2.32	162	0.55	9.0	2.05	133
11.....			2.03	131	0.45	5.5	1.75	103
12.....			1.85	113	0.44	5.2	1.63	91
13.....			1.72	100	0.44	5.2	1.55	83
14.....			1.63	91	0.50	7.0	1.65	93
15.....			1.55	83	0.80	22.0	1.43	72
16.....			1.45	73	1.05	39.0	1.35	64
17.....			1.45	73	1.05	39.0	1.33	63
18.....	2.66a	10.1	1.44	73	1.78	106.0	1.30	60
19.....	2.71	40.0	1.34	64	1.70	98.0	1.25	55
20.....	2.66	70.0	1.32	62	1.55	83.0	1.30	60
21.....	2.66	100.0	1.25	55	1.50	78.0	1.34	64
22.....	2.73	140.0	1.15	47	1.40	69.0	1.25	55
23.....	2.73	170.0	1.13	45	1.30	60.0	1.23	54
24.....	2.83	200.0	1.12	45	1.15	47.0	1.15	47
25.....	2.86	230.0	1.04	38	1.03	37.0	1.15	47
26.....	6.01	254.0	1.03	37	0.95	32.0	1.05	39
27.....	6.72	361.0	1.05	39	0.95	32.0	1.15	47
28.....	5.60	204.0	1.03	37	0.94	31.0	1.06	40
29.....	5.51	194.0	1.01	36	0.95	32.0	1.15	47
30.....	5.26	164.0	0.96	32	0.95	32.0	1.13	45
31.....	5.30	336.0			0.93	30.0		

a to b Ice conditions.

SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Battle Creek at Nash's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.06	40	1.15	47.0	0.68	15.0	0.85	25
2.....	1.04	38	1.04	38.0	0.72	17.2	0.84	24
3.....	0.97	33	1.03	37.0	0.82	23.0	0.84	24
4.....	0.96	32	1.00	35.0	0.81	23.0	0.85	25
5.....	1.00	35	0.96	32.0	0.83	24.0	0.85	25
6.....	0.95	32	0.95	32.0	0.85	25.0	0.88	27
7.....	0.95	32	0.90	28.0	0.85	25.0	0.90	28
8.....	0.97	33	0.87	26.0	0.85	25.0	0.94	31
9.....	1.00	35	0.85	25.0	0.85	25.0	0.94	31
10.....	1.15	47	0.83	24.0	0.83	24.0	1.00	35
11.....	1.06	40	0.77	20.0	0.90	28.0	0.95	32
12.....	1.05	39	0.75	19.0	0.83	24.0	0.95	32
13.....	1.05	39	0.75	19.0	0.85	25.0	0.95	32
14.....	0.95	32	0.71	16.6	0.85	25.0	0.95	32
15.....	0.96	32	0.73	17.8	0.85	25.0	0.96	32
16.....	1.74	102	0.73	17.8	0.90	28.0	0.98	34
17.....	1.74	102	0.73	17.8	0.93	30.0	0.95	32
18.....	1.65	93	0.73	17.8	0.92	29.0	0.96	32
19.....	1.65	93	0.71	16.6	0.93	30.0	0.94	31
20.....	1.64	92	0.71	16.6	0.89	27.0	0.92	29
21.....	1.52	80	1.05	39.0	0.86	26.0	0.85	25
22.....	1.40	69	0.95	32.0	0.85	25.0	0.84	24
23.....	1.34	64	0.90	28.0	0.84	24.0	0.83	24
24.....	1.25	55	0.88	27.0	0.89	27.0	0.86	26
25.....	1.15	47	0.85	25.0	0.85	25.0	0.86	26
26.....	1.08	41	0.70	16.0	0.84	24.0	0.85	25
27.....	1.12	45	0.77	20.0	0.83	24.0	0.85	25
28.....	1.15	47	0.75	19.0	0.83	24.0	0.84	24
29.....	1.20	51	0.75	19.0	0.84	24.0	0.89	27
30.....	1.13	45	0.73	17.8	0.83	24.0	0.83	24
31.....	1.23	54	0.71	16.6	.....	.....	0.82	23

## MONTHLY DISCHARGE of Battle Creek at Nash's Ranch, for 1915.

(Drainage area 500 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile	Depth in inches on Drainage Area.	Total in Acre-feet
March (18-31).....	361.0	10.1	177.0	0.354	0.18	4,904
April.....	976.0	32.0	230.0	0.460	0.51	13,686
May.....	106.0	5.2	36.0	0.072	0.08	2,214
June.....	272.0	25.0	87.0	0.174	0.19	5,172
July.....	102.0	32.0	52.0	0.104	0.12	3,197
August.....	47.0	16.0	25.0	0.050	0.06	1,517
September.....	30.0	15.0	25.0	0.050	0.06	1,488
October.....	35.0	23.0	28.0	0.056	0.06	1,722
The period.....					1.26	33,925

## FRENCHMAN RIVER DRAINAGE BASIN.

*General Description.*

Frenchman River drains the greater portion of southwestern Saskatchewan. It rises in Cypress Lake in Township 6, Range 26, West of the 3rd Meridian and follows a southeasterly course for some 150 miles, crossing into the United States in Range 10, West of 3rd Meridian. It eventually finds its way into Milk River near Saco, Montana, and therefore forms a part of the general drainage basin of the Missouri.

Cypress Lake is on the southern slope of Cypress Hills at an elevation of about 3155 feet above sea level. It occupies what is probably a portion of an abandoned water course or channel of an ancient river, which joined Battle Creek to the Frenchman River. The water of the lake is fresh and is supplied by a number of coulees and small streams which head in the hills to the north. The largest of these are Oxarart and Sucker creeks, both of which have a small continuous flow.

During dry years Cypress Lake does not overflow and the whole discharge of the Frenchman River is derived from Belanger, Davis and Fairwell Creeks and the north branch. From Township 6, Range 23, West of the 3rd Meridian, where the north branch joins the main stream, there is no appreciable supply to the river while in Canada. Mule Creek which joins the river in Township 5, Range 17, West of 3rd Meridian, and Snake Creek in Township 3, Range 13, West of 3rd Meridian, however, have a small flow.

The country surrounding Cypress Lake is of rolling prairie much broken by coulees. In many of these there is considerable tree growth but for the most part the country is devoid of all vegetation other than grasses. All the streams in the upper section of the drainage basin, with the exception of the north branch, rise on the plateau at the top of the hills. Flowing southward they break through deep well wooded gorges before reaching the lower flats along the river. The north branch, however, is in a deep valley throughout its entire length. Its feeders, like the western tributaries of the main stream, cut from the bench to the valley in deep well wooded coulees. Below the mouth of the north branch there is little tree growth. Here and there along the river may be found small growths of shrubs and maple, while up on the hillsides in some of the coulees there are small clumps of poplar covering an acre or so. Most of these coulees are rapidly becoming cleared by the settlers who are taking up the bench lands above the river valley. The benches are well covered with grasses but the hills and sides of the valley are almost devoid of all vegetation. In the flats along the river, except where irrigated, the chief vegetation consists of sage brush and cactus.

When the Frenchman River leaves the lake, it flows through a wide flat valley as far as the mouth of Fairwell Creek. Most of this land is under proposed or constructed irrigation ditches. Below this point the valley becomes more broken and narrows considerably while the side hills become higher. Small portions of this bottom will no doubt be brought under irrigation, but as yet little has been done in that direction.

Below the junction of the north branch, the valley becomes rough and rugged, the sides being cut with buttes and deep coulees. Here numerous outcroppings of lignite may be seen and also a deep seam of light coloured clay and sand. This seam, which has been bleached almost a pure white, shows at many points along the river's entire course and is one of the most conspicuous objects in this region. From its colour and nature the river receives its local name of the "Whitemud."

At East End, some miles lower down, the valley again widens out into flats. Here is located the largest irrigation project in the Cypress Hills district. J. C. Strong has a large dam in the river and a system of ditches and storage reservoirs, which irrigate a large part of the flat. Directly above this project there are two smaller irrigation schemes and just below Messrs. Morrison Brothers have a dam and ditch which will irrigate a large area. Their ditch is carried across the river and continued by Messrs. Duncan and Watson who irrigate another large area.

Below the East End flat none of the flats which occur at various points along the river are irrigated as yet. A short distance below the mouth of Snake Creek the river enters Bad Lands which continue into the United States.

On most of the tributary streams above Eastend and on some below that point there are irrigation schemes covering areas of various sizes.

The mean annual rainfall of this basin is not well established, but it is estimated that it would range from twelve to sixteen inches, most of which falls in May, June and July. From November to April, the streams are frozen over and usually there is an abundant rainfall.

During 1914, a number of stations were established on the lower tributaries of this stream and also two on the main stream. These stations were established to obtain the run-off of this lower region and the total discharge of the stream in Canada.

The construction of the Weyburn-Lethbridge branch of the Canadian Pacific Railway through the upper part of the valley has opened up that part of basin and this development has resulted in one or two settlements coming into existence, the most important of which is East End.

## SESSIONAL PAPER No. 25c

## OXARART CREEK AT WYLIE'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 20, Tp. 6, Rge. 27, W. 3rd Mer., at Joseph Wylie's ranch.

*Records available.*—From June 15, 1909 to October 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at 3199.02 feet during 1909-10; zero of gauge maintained at 3199.06 feet during 1911; zero of gauge maintained at 3199.03 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark, located on the right bank at the station. Elevation 3203.75 feet above mean sea level. (Irrigation Surveys.)

*Discharge measurements.*—Made by wading or with a weir.

*Winter flow.*—Station discontinued during winter season.

*Artificial control.*—On August 5, 1915, a permanent 36-inch sharp crested weir was installed twenty feet below the gauge which acts as a control for the gauge.

*Observer.*—Miss B. K. Wylie.

## DISCHARGE MEASUREMENTS of Oxarart Creek at Wylie's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 20.....	H. R. Carscallen.....	3.3	0.96	0.52	0.81	0.50
Mar. 29.....	do.....	4.9	2.40	0.45	0.92	1.10
April 6.....	do.....	22.2	24.00	3.42	1.42	84.00
April 7.....	do.....	22.5	24.00	3.00	1.36	71.00
April 22.....	H. W. Rowley.....	<i>a</i>	<i>a</i>	<i>a</i>	0.90	1.40
May 7.....	do.....	<i>a</i>	<i>a</i>	<i>a</i>	0.95	2.10
June 25.....	do.....	<i>a</i>	<i>a</i>	<i>a</i>	0.92	1.61
Aug. 4.....	do.....	<i>a</i>	<i>a</i>	<i>a</i>	0.90	1.46
Aug. 5.....	do.....	<i>a</i>	<i>a</i>	<i>a</i>	1.24 <sup>b</sup>	1.45
Sept. 4.....	do.....	<i>a</i>	<i>a</i>	<i>a</i>	1.20	1.15
Sept. 22.....	do.....	<i>a</i>	<i>a</i>	<i>a</i>	1.17	0.95

*a* Weir measurement.

*b* New control.

## DAILY GAUGE HEIGHT AND DISCHARGE of Oxarart Creek at Wylie's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.30	58.00	0.90	1.10	0.95	2.00
2.....			1.98	207.00	0.90	1.10	0.97	3.10
3.....			2.22	260.00	1.00	4.80	0.99	4.20
4.....			1.45	91.00	1.05	9.70	1.03	7.70
5.....			1.62	128.00	1.00	4.80	1.01	5.80
6.....			1.32	62.00	0.95	2.00	0.98	3.70
7.....			1.30	58.00	0.95	2.00	0.97	3.10
8.....			1.15	26.00	0.95	2.00	0.95	2.00
9.....			1.10	17.00	0.95	2.00	0.95	2.00
10.....			1.10	17.00	0.94	1.82	0.95	2.00
11.....			1.15	26.00	0.95	2.00	0.95	2.00
12.....			1.10	17.00	0.96	2.60	0.95	2.00
13.....			1.12	21.00	1.05	9.70	0.95	2.00
14.....			1.00	4.80	1.06	10.20	0.94	1.82
15.....			1.05	9.70	1.10	17.00	0.95	2.00
16.....			0.95	2.00	1.05	9.70	0.95	2.00
17.....			0.90	1.10	1.04	8.90	0.95	2.00
18.....			0.90	1.10	1.00	4.80	0.94	1.82
19.....			0.90a	1.10	0.98	3.70	0.94	1.82
20.....			0.90	1.10	0.97	3.10	0.94	1.82
21.....			0.90	1.10	0.95	2.00	0.95	2.00
22.....			0.89	1.02	0.94	1.82	0.94	1.82
23.....			0.90	1.10	0.94	1.82	0.94	1.82
24.....			0.95	2.00	0.93	1.60	0.95	2.00
25.....			0.95	2.00	0.92	1.50	0.95	2.00
26.....			0.90	1.10	0.92	1.50	0.95	2.00
27.....			0.89	1.02	0.94	1.82	0.95	2.00
28.....			0.90	1.10	0.95	2.00	0.95	2.00
29.....	1.25	47	0.90	1.10	0.95	2.00	0.95	2.00
30.....	1.30	58	0.91	1.28	0.95	2.00	0.95	2.00
31.....	1.50	102			0.95	2.00		

a Gauge height interpolated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Oxarart Creek at Wylie's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.95	2.00	0.91	1.28	1.20	1.15	1.15	0.82
2.....	0.95	2.00	0.91	1.28	1.20	1.15	1.15	0.82
3.....	0.94	1.82	0.91	1.28	1.20	1.15	1.15	0.82
4.....	0.94	1.82	0.91	1.28	1.20	1.15	1.15	0.82
5.....	0.94	1.82	1.24a	1.45	1.20	1.15	1.15	0.82
6.....	0.94	1.82	1.24	1.45	1.20	1.15	1.18	1.01
7.....	0.94	1.82	1.24	1.45	1.20	1.15	1.18	1.01
8.....	1.01	5.80	1.24	1.45	1.20	1.15	1.20	1.15
9.....	1.02	6.80	1.24	1.45	1.20	1.15	1.20	1.15
10.....	1.00	4.80	1.24	1.45	1.20	1.15	1.22	1.30
11.....	0.95	2.00	1.24	1.45	1.20	1.15	1.22	1.30
12.....	0.94	1.82	1.24	1.45	1.20	1.15	1.22	1.30
13.....	0.95	2.00	1.24	1.45	1.20	1.15	1.22	1.30
14.....	0.95	2.00	1.24	1.45	1.18	1.01	1.20	1.15
15.....	0.95	2.00	1.24	1.45	1.18	1.01	1.20	1.15
16.....	0.95	2.00	1.24	1.45	1.18	1.01	1.18	1.01
17.....	0.95	2.00	1.24	1.45	1.18	1.01	1.17	0.95
18.....	0.99	4.20	1.24	1.45	1.18	1.01	1.17	0.95
19.....	0.99	4.20	1.25	1.53	1.18	1.01	1.17	0.95
20.....	0.90	1.10	1.25	1.53	1.18	1.01	1.15	0.82
21.....	0.91	1.28	1.25	1.53	1.18	1.01	1.15	0.82
22.....	0.91	1.28	1.25	1.53	1.18	1.01	1.14	0.76
23.....	0.91	1.28	1.25	1.53	1.18	1.01	1.14	0.76
24.....	0.91	1.28	1.25	1.53	1.18	1.01	1.14	0.76
25.....	0.91	1.28	1.25	1.53	1.18	1.01	1.14	0.76
26.....	0.91	1.28	1.20	1.15	1.18	1.01	1.14	0.76
27.....	0.91	1.28	1.20	1.15	1.18	1.01	1.10	0.52
28.....	0.91	1.28	1.20	1.15	1.18	1.01	1.10	0.52
29.....	0.91	1.28	1.20	1.15	1.18	1.01	1.10	0.52
30.....	0.90	1.10	1.20	1.15	1.18	1.01	1.10	0.52
31.....	0.91	1.28	1.20	1.15			1.10b	0.52

a to b 36" weir installed as control. Zero flow gauge height, 96.

## MONTHLY DISCHARGE of Oxarart Creek at Wylie's Ranch, for 1915.

(Drainage area 77 square miles.)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (29-31).....	102.00	47.00	69.00	0.8960	0.10	410
April.....	260.00	1.02	34.00	0.4420	0.49	2,023
May.....	17.00	1.10	4.00	0.0500	0.06	246
June.....	7.70	1.82	2.50	0.0325	0.04	149
July.....	6.80	1.10	2.20	0.0286	0.03	135
August.....	1.53	1.15	1.39	0.0180	0.02	85
September.....	1.15	1.01	1.07	0.0140	0.02	64
October.....	1.30	0.52	0.90	0.0117	0.01	55
The period.....					0.77	3,167

## SUCKER CREEK AT GILCHRIST'S RANCH.

Location.—On the NW ¼ Sec. 24, Tp. 6, Rge. 26, W. 3rd Mer.

Records available.—May 25, 1909, to October 31, 1915.

Gauge.—Vertical staff. Elevation of the zero of the gauge has been maintained at 3191.11 feet since April, 1912. Elevation of the old gauge two hundred feet below was 3189.20 feet

*Bench-mark.*—Permanent iron bench-mark. Elevation 3196.25 feet above mean sea level. (Irrigation Surveys.)

*Channel.*—Slightly shifting.

*Discharge measurements.*—Made by meter and by weir in low stages.

*Winter flow.*—This station has not been maintained during winter.

*Observer.*—J. D. Gilchrist.

# DISCHARGE MEASUREMENTS of Sucker Creek at Gilchrist's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 30.....	M. H. French.....	13.0	4.90	1.31	0.84	6.40
April 12.....	do.....	9.0	5.40	2.04	1.26	11.00
May 16.....	J. E. Caughey.....	7.5	7.10	1.97	1.41	14.00
June 17.....	do.....	6.0	2.80	1.14	1.01	3.20
July 16.....	do.....	6.5	2.57	1.14	1.02	3.60
Aug. 6.....	do.....	7.0	2.70	0.84	0.95	2.30
Aug. 27.....	do.....	7.0	2.55	0.76	0.94	1.94
Sept. 28.....	do.....	6.5	3.20	0.97	1.00	3.10
Oct. 18.....	do.....	6.6	2.75	0.89	0.98	2.50
Oct. 29.....	do.....	7.0	2.80	0.88	0.98	2.50

# DAILY GAUGE HEIGHT AND DISCHARGE of Sucker Creek at Gilchrist's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.83	6.6	<i>b</i>	8.3	1.50	10.5
2.....			1.92	22.0		8.3	1.50	10.5
3.....			4.75	102.0		8.4	1.50	10.5
4.....			3.40	62.0		8.5	1.50	10.5
5.....			2.60	38.0		8.6	1.50	10.5
6.....			1.75	18.9		8.7	1.45	9.8
7.....			1.58	16.0		8.7	1.40	9.0
8.....			1.35	12.5		8.8	1.35	8.2
9.....			1.35	12.5		8.8	1.05	3.8
10.....			1.32	12.1		8.9	1.05	3.8
11.....			1.22	10.8		8.9	1.05	3.8
12.....			1.24	11.0		9.0	1.05	3.8
13.....			1.31	11.9		9.1	1.04	3.6
14.....			1.30	11.8		9.2	1.00	3.0
15.....			1.30	11.8		9.2	1.00	3.0
16.....			1.30	11.8	1.41	9.2	1.05	3.8
17.....			1.30	11.8	1.20 <i>a</i>	6.0	1.01	3.2
18.....			1.29	11.7	1.03	3.4	0.90	1.6
19.....			1.13	9.7	1.05	3.8	1.00	3.0
20.....			1.10	9.3	1.04	3.6	1.11	4.6
21.....			1.09 <i>a</i>	9.2	1.04	3.6	1.04	3.6
22.....			1.08	9.1	1.03	3.4	1.01	3.2
23.....	0.85	6.6	1.03	8.5	1.03	3.4	1.00	3.0
24.....	0.70	5.1	1.03	8.5	1.03	3.4	0.90	1.6
25.....	0.80	6.1	1.02	8.3	0.99	2.9	1.15	5.2
26.....	0.85	6.6	1.02	8.3	1.00	3.0	1.10	4.5
27.....	0.73	5.4	1.02	8.3	1.00	3.0	1.05	3.8
28.....	0.83	6.4	1.02 <i>a</i>	8.3	0.92	1.9	1.00	3.0
29.....	0.84	6.5	1.02 <i>a</i>	8.3	0.92	1.9	1.00	3.0
30.....	0.70	5.1	1.02 <i>a</i>	8.3	1.00	3.0	1.00	3.0
31.....	0.76	5.7			1.00	3.0		

*a* Gauge height interpolated.

*b* to *c* No gauge height records; discharge estimated.



SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Sucker Creek at Gilchrist's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.00	3.0	1.01	3.2	1.00	3.0	0.93	2.0
2.....	1.00	3.0	1.00	3.0	1.95	17.2	0.95	2.3
3.....	1.00	3.0	1.00	3.0	1.00	3.0	1.00	3.0
4.....	0.95	2.3	1.00	3.0	1.90	16.5	1.00	3.0
5.....	0.90	1.6	0.98	2.7	1.75	14.2	0.97	2.6
6.....	0.90	1.6	0.96	2.4	1.00	3.0	0.98	2.7
7.....	0.90	1.6	0.96	2.4	1.25	6.7	1.00	3.0
8.....	1.05	3.8	0.96	2.4	1.10	4.5	1.95	17.2
9.....	1.18	5.7	0.95	2.3	1.27	7.1	1.87	16.0
10.....	1.16	5.4	0.95	2.3	1.00	3.0	1.80	15.0
11.....	1.00	3.0	0.93	2.0	1.10	4.5	1.00	3.0
12.....	0.95	2.3	0.93	2.0	1.10	4.5	1.00	3.0
13.....	0.95	2.3	0.92	2.0	1.15	5.2	1.00	3.0
14.....	1.05	3.8	0.92	2.0	1.00	3.0	1.00	3.0
15.....	1.05	3.8	0.92	2.0	1.00	3.0	1.05	3.8
16.....	1.02	3.3	1.00	3.0	0.95	2.3	1.00	3.0
17.....	1.04	3.6	0.98	2.7	0.95	2.3	1.07	4.0
18.....	1.30	7.5	0.98	2.7	0.94	2.2	0.98	2.7
19.....	1.30	7.5	1.10	4.5	0.97	2.6	0.99	2.9
20.....	1.30	7.5	1.08	4.2	0.95	2.3	0.97	2.6
21.....	1.12	4.8	1.08	4.2	0.94	2.2	0.97	2.6
22.....	1.04	3.6	1.00	3.0	0.90	1.6	0.95	2.3
23.....	1.00	3.0	1.05	3.8	0.90	1.6	0.96	2.4
24.....	1.08	4.2	0.98	2.7	0.75	0.4	1.00	3.0
25.....	1.05	3.8	0.98	2.7	0.75	0.4	1.05	3.8
26.....	1.04	3.6	0.94	2.2	0.80	0.8	1.07	4.0
27.....	1.04	3.6	0.94	2.2	0.80	0.8	1.03	3.4
28.....	1.05	3.8	0.94	2.2	1.00	3.0	1.02	3.3
29.....	1.06	3.9	1.00	3.0	0.90	1.6	1.04	3.6
30.....	1.03	3.4	1.00	3.0	0.91	1.7	1.00	3.0
31.....	1.02	3.3	1.00	3.0			1.04	3.6

## MONTHLY DISCHARGE of Sucker Creek at Gilchrist's Ranch, for 1915.

(Drainage area 30 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31).....	6.6	5.1	6.0	0.200	0.07	107
April.....	102.0	6.6	16.7	0.557	0.62	994
May.....	9.2	1.9	6.1	0.203	0.23	375
June.....	10.5	1.6	5.1	0.170	0.19	304
July.....	7.5	1.6	3.8	0.127	0.15	244
August.....	4.5	2.0	2.8	0.093	0.11	172
September.....	17.2	4.0	4.1	0.137	0.15	244
October.....	17.2	2.0	4.3	0.143	0.16	264
The period.....					1.68	2,694

## BELANGER CREEK AT OAKES' RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 19, Tp. 6, Rge. 25, W. 3rd Mer., previous to August 7, 1915, was a mile upstream on the SW.  $\frac{1}{4}$  Sec. 30, Tp. 6, Rge. 25, W. 3rd Mer.

*Records available.*—April 1, 1912, to April 11, 1914; June 17, 1915, to October 31, 1915.

*Gauge.*—Vertical staff. The zero elevation of the gauge was maintained at 3164.10 feet from date of establishment until August 7, 1915; from August 7 until October 31, 1915, it was maintained at 3447.71 feet at the new station.

*Bench-mark.*—Permanent iron bench-mark. Elevation, 3168.37 feet above mean sea level. (Irrigation Surveys.)

*Channel*.—Slightly shifting, affected by weeds.

*Discharge measurements*.—Made with meter.

*Winter flow*.—This station is not maintained during the winter.

*Diversions*.—Messrs. R. G. Williamson, T. A. Drury, J. H. G. Bettington, Dixon and Stewart divert water for irrigation purposes above the gauge.

*Observer*.—Joseph Drury.

# DISCHARGE MEASUREMENTS of Belanger Creek at Oakes' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 16.....	J. E. Caughey.....	17.0	10.10	2.38	0.58	24.0
June 17.....	do.....	16.0	7.05	1.30	0.40	9.2
July 16.....	do.....	11.0	19.65	0.68	0.44	13.5
Aug. 7.....	do.....	9.6 <sup>a</sup>	19.76	0.37	3.75	7.2
Aug. 27.....	do.....	10.0	16.40	0.30	3.39	5.0
Sept. 28.....	do.....	10.5	19.27	0.33	3.56	6.5
Oct. 18.....	do.....	10.2	14.98	0.49	3.37	7.4
Oct. 29.....	do.....	9.5b	13.17	0.50	3.25	6.6

*a* to *b* New station, one mile downstream.

# DAILY GAUGE HEIGHT AND DISCHARGE of Belanger Creek at Oakes' Ranch, for 1915.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.53	17.8	0.27	6.2	3.50	5.8	3.55	6.2
2.....			0.58	22.0	0.27	6.2	3.75	7.6	3.56	6.3
3.....			0.63	26.0	0.28	6.4	3.75	7.6	3.60	6.7
4.....			0.63	26.0	0.28	6.4	3.70	7.2	3.60	6.9
5.....			0.63	26.0	0.27	6.2	3.70	7.2	3.60	7.0
6.....			0.73	35.0	0.27	6.2	3.70	7.2	3.60	7.2
7.....			0.73	35.0	3.75 <sup>c</sup>	7.6	3.75	7.6	3.57	7.3
8.....			0.74	36.0	3.75	7.6	3.80	8.0	3.55	7.3
9.....			0.83	44.0	3.74	7.5	3.75	7.6	3.50	7.0
10.....			0.82	43.0	3.74	7.5	3.75	7.6	3.45	6.8
11.....			0.78	39.0	3.76	7.7	3.75	7.6	3.45	7.0
12.....			0.78	39.0	3.80	8.0	3.75	7.6	3.44	7.0
13.....			0.75	36.0	3.80	8.0	3.80	8.0	3.44	7.2
14.....			0.73	35.0	3.80	8.0	3.80	8.0	3.42	7.2
15.....			0.63 <sup>a</sup>	26.0	3.77	7.8	3.75	7.6	3.40	7.1
16.....			0.44	12.5	3.77	7.8	3.75	7.6	3.40	7.3
17.....	0.43	12.0	0.43	12.0	3.75	7.6	3.65	6.8	3.38 <sup>a</sup>	7.3
18.....	0.54	18.5	0.41	11.0	3.75	7.6	3.65	6.8	3.37	7.4
19.....	0.58	22.0	0.41	11.0	3.88	8.6	3.65	6.8	3.36 <sup>d</sup>	7.3
20.....	0.58	22.0	0.39	10.1	3.85	8.4	3.65	6.8	3.35	7.3
21.....	0.57	21.0	0.38	9.8	3.95	9.2	3.60	6.4	3.33	7.1
22.....	0.53	17.8	0.36	9.1	3.70	7.2	3.60	6.4	3.31	7.0
23.....	0.51	16.2	0.35	8.7	3.65	6.8	3.65	6.8	3.30	6.9
24.....	0.48	14.5	0.36	9.1	3.60	6.4	3.65	6.8	3.29	6.8
25.....	0.44	12.5	0.36	9.1	3.50	5.8	3.65	6.8	3.28	6.7
26.....	0.40	10.5	0.39	10.1	3.50	5.8	3.60	6.4	3.27	6.7
27.....	0.48	14.5	0.38	9.8	3.40	5.2	3.59	6.3	3.27	6.7
28.....	0.53	17.8	0.36	9.1	3.40 <sup>a</sup>	5.2	3.56	6.2	3.26 <sup>e</sup>	6.6
29.....	0.53	17.8	0.36	9.1	3.40 <sup>a</sup>	5.2	3.56	6.2	3.25	6.6
30.....	0.53	17.8	0.34	8.3	3.40	5.2	3.56	6.3	3.25 <sup>a</sup>	6.6
31.....			0.30	6.9	3.40	5.2			3.25 <sup>a</sup>	6.6

*a, d-e* Gauge heights interpolated.

*c* New station established.

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGES of Belanger Creek at Oakes' Ranch, for 1915.

(Drainage area 65 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June (17-30) .....	22.0	10.5	16.8	0.258	0.13	452
July .....	44.0	6.9	21.0	0.323	0.37	1,291
August .....	9.2	5.2	6.9	0.106	0.12	424
September .....	8.0	5.8	7.1	0.109	0.12	422
October .....	7.4	6.2	6.9	0.106	0.12	424
The period .....					0.86	4,013

## DAVIS CREEK AT DRURY'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 29, Tp. 6, Rge. 25, W. 3rd Mer.*Records available.*—May 24 to November 3, 1909; April 23, 1911, to October 31, 1915.*Gauge.*—Vertical staff. Zero elevation has been maintained at 3176.79 feet since establishment.*Bench-mark.*—Permanent iron bench-mark. Elevation 3183.06 feet above mean sea level.

(Irrigation Surveys.)

*Channel.*—Permanent.*Discharge measurements.*—Made with meter and with weir at low stages.*Winter flow.*—This station is not maintained during the winter.*Diversions.*—Mr. B. C. Wright diverts water for irrigation purposes above the gauge.*Observer.*—Joseph Drury.

## DISCHARGE MEASUREMENTS of Davis Creek at Drury's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 30	M. H. French	14.0	6 10	1 39	0 61	8 50
April 12	do	19 0	14 80	2 15	0 78	32 00
May 14	J. E. Caughey	21 0	24 70	1 07	0 73	26 00
June 17	do	10 4	3 18	1 30	0 35	4 10
July 15	do	16 0	11 15	1 51	0 56	16 00
Aug. 6	do	8 5	1 08	1 19	0 30	2 40
Aug. 27	do	5 a	1 55	1 45	0 25	2 20
Sept. 28	do				0 19	0 64
Oct. 18	do	5 3	1 90	1 56	0 32	3 00
Oct. 29	do	5 1	1 50	1 33	0 28	1 99

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Davis Creek at Drury's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.72	27.0	0.32	3.10	0.45	8.8
2.....			2.61	184.0	0.31	2.80	0.95	46.0
3.....			5.03	384.0	0.30	2.40	1.10	59.0
4.....			4.20	316.0	0.29	2.20	1.18	65.0
5.....			2.95	212.0	0.28	2.10	0.99	49.0
6.....			1.67	106.0	0.27	1.89	0.80	34.0
7.....			1.27	73.0	0.27	1.89	0.65	22.0
8.....			1.00	58.0	0.26	1.72	0.55	14.6
9.....			1.00	50.0	0.26	1.72	0.50	11.4
10.....			0.80	34.0	0.26	1.72	0.47	9.8
11.....			0.74	29.0	0.26	1.72	0.45	8.8
12.....			0.81	35.0	0.26	1.72	0.45	8.8
13.....			0.79	33.0	0.26	1.72	0.43	7.7
14.....			0.75	30.0	0.27	1.89	0.40	6.1
15.....			0.70	25.0	0.50	11.40	0.39	5.7
16.....			0.58	16.6	0.73	28.00	0.37	5.0
17.....			0.56	15.3	0.70	25.00	0.35	4.2
18.....			0.53	13.4	0.67	23.00	0.37	5.0
19.....			0.53	13.4	0.60	17.90	0.42	7.2
20.....			0.51 <sup>a</sup>	12.0	0.55	14.60	0.71	26.0
21.....			0.49	10.9	0.50	11.40	0.67	23.0
22.....			0.48	10.3	0.40	6.10	0.60	17.9
23.....	0.30	2.40	0.47	9.8	0.30	2.40	0.50	11.4
24.....	0.26	1.72	0.46 <sup>a</sup>	9.3	0.27	1.89	0.40	6.1
25.....	0.26	1.72	0.44 <sup>a</sup>	8.2	0.25	1.55	0.31	2.8
26.....	0.25	1.55	0.43	7.7	0.26	1.72	0.40	6.1
27.....	0.43	7.70	0.39	5.7	0.25	1.55	0.42	7.2
28.....	0.51	12.00	0.35	4.2	0.45	8.80	0.45	8.8
29.....	0.59	17.20	0.33	3.5	0.46	9.30	0.45	8.8
30.....	0.61	18.60	0.33	3.5	0.45	8.80	0.44	8.2
31.....	0.61	18.60			0.45	8.80		

<sup>a</sup> Gauge height interpolated.

SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Davis Creek at Drury's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.45	8.8	0.38	5.40	0.24	1.38	0.19	0.65
2.....	0.45	8.8	0.35	4.20	0.24	1.38	0.19	0.65
3.....	0.45	8.8	0.32	3.10	0.24	1.38	0.19	0.65
4.....	0.44	8.2	0.30	2.40	0.24	1.38	0.21	0.87
5.....	0.44	8.2	0.30	2.40	0.24	1.38	0.23	1.21
6.....	0.43	7.7	0.30	2.40	0.24	1.38	0.25	1.55
7.....	0.40	6.1	0.30	2.40	0.24	1.38	0.29	2.20
8.....	0.70	25.0	0.30	2.40	0.24	1.38	0.31	2.80
9.....	1.01	51.0	0.30	2.40	0.24	1.38	0.34	3.90
10.....	0.96	47.0	0.30	2.40	0.24	1.38	0.37	5.00
11.....	0.85	38.0	0.30	2.40	0.24	1.38	0.39	5.70
12.....	0.75	30.0	0.30	2.40	0.24	1.38	0.38	5.40
13.....	0.65	22.0	0.29	2.20	0.24	1.38	0.37	5.00
14.....	0.60	17.9	0.29	2.20	0.24	1.38	0.36	4.60
15.....	0.56	15.3	0.29	2.20	0.24	1.38	0.34	3.90
16.....	0.55	14.6	0.30	2.40	0.24	1.38	0.33	3.50
17.....	0.53	13.4	0.30	2.40	0.24	1.38	0.32	3.10
18.....	0.52	12.7	0.30	2.40	0.24	1.38	0.32	3.10
19.....	0.50	11.4	0.30	2.40	0.24	1.38	0.32	3.10
20.....	0.49	10.9	0.29	2.20	0.24	1.38	0.31	2.80
21.....	0.41	6.6	0.35	4.20	0.24	1.38	0.31	2.80
22.....	0.40	6.1	0.35	4.20	0.24	1.38	0.31	2.80
23.....	0.43	7.7	0.33	3.50	0.23	1.21	0.30	2.40
24.....	0.41	6.6	0.30	2.40	0.22	1.04	0.30	2.40
25.....	0.40	6.1	0.28	2.10	0.21	0.87	0.29	2.20
26.....	0.40	6.1	0.25	1.55	0.21	0.87	0.29	2.20
27.....	0.40	6.1	0.25	1.55	0.20	0.70	0.29	2.20
28.....	0.40	6.1	0.25a	1.55	0.19	0.65	0.28	2.10
29.....	0.55	14.6	0.25a	1.38	0.19	0.65	0.28	2.10
30.....	0.45	8.8	0.24	1.38	0.19	0.65	0.28	2.10
31.....	0.42	7.2	0.24	1.38	.....	.....	0.28	2.10

## MONTHLY DISCHARGE of Davis Creek at Drury's Ranch, for 1915.

(Drainage area 45 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31).....	18.60	1.55	9.00	0.200	0.07	161
April.....	38.40	3.50	58.00	1.270	1.41	3,481
May.....	2.80	1.55	6.00	0.151	0.17	418
June.....	6.50	2.80	16.80	0.371	0.42	1,090
July.....	5.10	6.10	14.50	0.322	0.37	892
August.....	5.40	1.38	2.50	0.066	0.06	164
September.....	1.55	0.65	1.23	0.027	0.03	72
October.....	5.70	0.65	2.70	0.060	0.07	166
The period.....					2.83	6,815

## FAIRWELL CREEK AT DRURY'S RANCH

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 30, Tp. 6, Rge. 24, W. 3rd Mer.*Records available.*—June 10, 1909, to October 31, 1915.*Gauge.*—Vertical staff. Zero elevation has been maintained at 3122.77 feet since establishment.*Bench-mark.*—Permanent iron bench-mark. Elevation, 3127.64 feet above sea level (Irrigation Surveys' datum.)

*Channel*.—Slightly shifting owing to beaver dams.

*Discharge measurements*.—Made with meter; weir at low periods.

*Diversions*.—Messrs. Armstrong and Sons, Kearney Bros. and J. Ingram divert water for irrigation purposes above the gauge.

*Observer*.—C. A. Drury.

### DISCHARGE MEASUREMENTS of Fairwell Creek at Drury's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 30.....	M. H. French.....	11.0	3 10	0.44	2.49	1.37
April 10.....	do.....	81.0	57.95	1.21	3.07	70.00
April 13.....	do.....	78.0	42.40	1.18	2.91	50.00
April 21.....	do.....	13.4	8.17	2.18	2.56	17.80
May 16.....	J. E. Caughey.....	18.0	9.75	2.90	2.60	28.00
June 17.....	do.....	13.0	9.90	1.24	2.49	12.20
July 15.....	do.....	14.0	9.00	1.40	2.43	12.60
Aug. 5.....	do.....	12.0	7.80	1.39	2.43	10.60
Aug. 27.....	do.....	12.0	5.30	0.97	2.26	5.10
Sept. 27.....	do.....	12.0	5.35	0.62	2.18	3.30
Oct. 15.....	do.....	11.0	4.05	0.69	2.18	2.80
Oct. 29.....	do.....	12.5	6.17	0.74	2.26	4.60

### DAILY GAUGE HEIGHT AND DISCHARGE of Fairwell Creek at Drury's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.73	10.0	2.41	10.0	2.70	27.0
2.....			3.87	126.0	2.40	9.5	3.10	74.0
3.....			5.03	294.0	2.39	9.1	3.23	91.0
4.....			4.65	250.0	2.38	8.8	3.18	84.0
5.....			4.31	208.0	2.37	8.5	3.01	62.0
6.....			3.87	156.0	2.38	8.8	2.81	38.0
7.....			3.69	138.0	2.38	8.8	2.72	29.0
8.....			3.34	97.0	2.38	8.8	2.65	23.0
9.....			3.29	96.0c	2.37	8.5	2.54	16.2
10.....			3.08d	71.0	2.37	8.5	2.49	13.6
11.....			2.97	57.0	2.37	8.5	2.50	14.0
12.....			2.94	53.0	2.35	7.8	2.49	13.6
13.....			2.91	49.0	2.35	7.8	2.48	13.1
14.....			2.94	53.0	2.35	7.8	2.49	13.6
15.....			2.85	42.0	2.34	7.4	2.48	13.1
16.....			2.79	36.0	2.63	22.0	2.50	14.0
17.....			2.75	32.0	2.67	25.0	2.50	14.0
18.....			2.71	28.0	2.60	19.6	2.49	13.6
19.....			2.63	22.0	2.54	16.2	2.65	23.0
20.....			2.59	19.0	2.48	13.1	3.00	61.0
21.....			2.55	16.8	2.43	10.8	2.98	58.0
22.....			2.51	14.6	2.40	9.5	2.88	46.0
23.....			2.50	14.0	2.38	8.8	2.74	31.0
24.....	2.49	1.37a	2.48	13.1	2.37	8.5	2.62	21.0
25.....	2.48	1.35	2.47	12.6	2.47	12.6	2.60	19.6
26.....	2.46	1.34	2.48	13.1	2.83	40.0	2.54	16.2
27.....	2.47	1.34	2.43	10.8	2.81	38.0	2.65	23.0
28.....	2.48	1.35	2.43	10.8	2.63	22.0	2.65	23.0
29.....	2.49	1.37b	2.43	10.8	2.73	30.0	2.60	19.6
30.....	2.49	1.37	2.43	10.8	2.69	26.0	2.55	16.8
31.....	2.53	2.70			2.69	26.0		

a to b Discharge interpolated.

b to c Shifting conditions.

d Gauge height interpolated.

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DAILY GAUGE HEIGHT AND DISCHARGE of Fairwell Creek at Drury's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.50	14.0	2.56	17.4	2.26	4.9	2.20	3.3
2.....	2.49	13.6	2.55	16.8	2.26	4.9	2.20	3.3
3.....	2.48	13.1	2.52	15.1	2.26	4.9	2.22	3.8
4.....	2.45	11.8	2.48	13.1	2.26	4.9	2.26	4.9
5.....	2.45	11.8	2.43	10.9	2.26	4.9	2.26	4.9
6.....	2.45	11.8	2.43	10.9	2.25	4.6	2.24	4.4
7.....	2.45	11.8	2.43	10.9	2.25	4.6	2.24	4.4
8.....	2.47	12.6	2.43	10.9	2.25	4.6	2.20	3.3
9.....	2.52	15.1	2.41	10.0	2.25	4.6	2.19	3.1
10.....	2.50	14.0	2.39	9.1	2.26	4.9	2.19	3.1
11.....	2.45	11.8	2.38	8.8	2.26	4.9	2.19	3.1
12.....	2.45	11.8	2.38	8.8	2.26	4.9	2.19	3.1
13.....	2.45	11.8	2.38	8.8	2.26	4.9	2.19	3.1
14.....	2.45	11.8	2.37	8.5	2.26	4.9	2.18	2.9
15.....	2.43	10.9	2.37	8.5	2.26	4.9	2.17	2.7
16.....	2.43	10.9	2.36	8.1	2.26	4.9	2.17	2.7
17.....	2.55	16.8	2.35	7.8	2.26	4.9	2.17	2.7
18.....	2.74	31.0	2.35	7.8	2.26	4.9	2.17	2.7
19.....	2.72	29.0	2.35	7.8	2.26	4.9	2.18	2.9
20.....	2.65	23.0	2.34	7.4	2.26	4.9	2.18	2.9
21.....	2.64	23.0	2.33	7.0	2.26	4.9	2.18	2.9
22.....	2.60	19.6	2.33	7.0	2.25	4.6	2.19	3.1
23.....	2.60	19.6	2.33	7.0	2.25	4.6	2.20	3.3
24.....	2.55	16.8	2.33	7.0	2.24	4.4	2.20	3.3
25.....	2.50	14.0	2.33	7.0	2.23	4.1	2.21	3.6
26.....	2.48	13.1	2.32	6.7	2.21	3.6	2.21	3.6
27.....	2.50	14.0	2.30	6.0	2.19	3.1	2.21	3.6
28.....	2.55	16.8	2.28	5.5	2.19	3.1	2.21	3.6
29.....	2.60	19.6	2.26	4.9	2.19	3.1	2.21	3.6
30.....	2.60	19.6	2.26	4.9	2.19	3.1	2.21	3.6
31.....	2.58	18.5	2.26	4.9			2.21	3.6

## MONTHLY DISCHARGE of Fairwell Creek at Drury's Ranch, for 1915.

(Drainage area 125 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (24-31).....	2.7	1.34	1.53	0.012	0.01	24
April.....	294.0	10.00	65.00	0.520	0.58	3,868
May.....	40.0	7.40	14.70	0.118	0.14	904
June.....	91.0	13.10	64.00	0.512	0.57	3,808
July.....	31.0	10.00	15.00	0.127	0.15	978
August.....	17.1	4.00	8.00	0.071	0.08	547
September.....	4.0	3.10	4.60	0.036	0.04	268
October.....	4.0	2.70	3.40	0.027	0.03	209
The period.....					1.60	10,606

## A. M. CROSS DITCH FROM CALF CREEK.

Location.—On SE.  $\frac{1}{4}$  Sec. 5, Tp. S, Rge. 22, W. 3rd Mer.

Records available.—June 1 to September 13, 1914.

Gauge, Vertical staff, located about forty feet from the intake of the ditch. Elevation of the zero of the gauge has been maintained at 96.06 feet since establishment.

Bench-mark.—Is a poplar stump on the left bank of the ditch surrounded by a cairn of stones; assumed elevation 100.00 feet.



*Channel.*—Slightly shifting, owing to growth of weeds.

*Discharge measurements.*—Made with meter.

*Observer.*—A. M. Cross.

*Remarks.*—J. E. Caughey visited this station on June 15 and August 4, 1915, and reported no flow on both occasions.

#### F. CROSS DITCH FROM NORTH BRANCH OF FRENCHMAN RIVER.

*Location.* On NW.  $\frac{1}{4}$  Sec. 15, Tp. 7, Rge. 22, W. 3rd Mer., about 130 feet from the intake of the ditch.

*Records available.*—June 1912 to July 7, 1915.

*Gauge.*—Staff fastened to the left side of the flume. Elevation of zero maintained at 94.45 feet from establishment to July 27, 1915, and 96.63 feet since that date.

*Bench-mark.*—On July 27, 1915, a permanent iron bench-mark was set on the right bank about 10 feet north of the gauge. The assumed elevation is 100.00 feet.

*Discharge measurements.*—Made by meter at the section, or by a weir in the ditch.

*Observer.*—Frank Cross.

#### DISCHARGE MEASUREMENTS OF F. Cross Ditch from North Branch of Frenchman River, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 15.....	J. E. Caughey.	2.7	3.78	0.25	1.48	0.92
Aug. 3.....	do					Nil.

#### DAILY GAUGE HEIGHT AND DISCHARGE OF F. Cross Ditch from North Branch of Frenchman River, for 1915.

DAY	May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.60	1.08	1.46	0.90
2.....					1.46	0.90
3.....					1.44	0.88
4.....					1.46	0.90
5.....					1.44	0.88
6.....					1.44	0.88
7.....					1.44	0.88
8.....						
9.....						
10.....						
11.....						
12.....						
13.....						
14.....			1.42a	0.85		
15.....			1.46	0.90		
16.....			1.46	0.90		
17.....			1.50	0.95		
18.....			1.46	0.90		
19.....			1.46	0.90		
20.....						
21.....						
22.....						
23.....						
24.....	1.50a	0.95	1.42a	0.85		
25.....	1.50	0.95	1.42	0.85		
26.....	1.67	1.18	1.50	0.95		
27.....	1.58	1.05	1.44	0.88		
28.....	1.50	0.95	1.44	0.88		
29.....	1.50	0.95	1.42	0.85		
30.....			1.42	0.85		
31.....	1.50a	0.95				

a Headgate opened.

c Headgate closed.

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MONTHLY DISCHARGE of F. Cross Ditch from North Branch of Frenchman River, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May (24-29, 31).....	1 18	0 95	1 00	14 00
June (1, 14-20, 24-30).....	0 95	0 85	0 80	25 00
July (1-7).....	0 90	0 83	0 89	12 00
The period.....				51 00

## NORTH BRANCH OF FRENCHMAN RIVER AT CROSS' RANCH.

*Location.*—On NE.  $\frac{1}{4}$  Sec. 16, Tp. 7, Rge. 22, W. 3rd Mer., at F. Cross' ranch near East End.*Records available.*—August 1, 1908, to October 31, 1915.*Gauge.*—Vertical staff. The elevation of zero maintained at 91.28 feet during 1908-11; the elevation of zero maintained at 90.27 feet during 1912-15.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Channel.*—Sandy and slightly shifting.*Discharge measurements.*—Made by wading.*Winter flow.*—Station not maintained during winter.*Diversions.*—F. Cross and A. M. Cross divert water above this station for irrigation. F. Cross was the only one to divert water during 1915.*Observer.*—Frank Cross.

## DISCHARGE MEASUREMENTS of North Branch of Frenchman River at Cross' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft</i>
April 5.....	M. H. French.....	10.2	14.33	5 33	2 75	78 0
April 8.....	do.....	13.0	6 50	2 24	1 11	14 6
April 15.....	do.....	12 5	9 25	1 22	0 93	11 2
May 7.....	J. E. Caughey.....	11 3	7 74	0 99	0 85	7 6
June 15.....	do.....	11 5	8 07	1 12	0 78	9 1
July 12.....	do.....	11 5	7 70	0 97	0 73	7 4
Aug. 3.....	do.....	11 5	7 72	0 96	0 74	7 4
Aug. 23.....	do.....	12 0	7 55	1 02	0 71	7 7
Sept. 11.....	G. H. Whyte and J. E. Caughey.....	11 2	7 13	1 10	0 72	7 9
Sept. 24.....	J. E. Caughey.....	11 5	7 40	1 01	0 72	7 5
Oct. 13.....	do.....	11 5	7 35	1 27	0 73	9 4
Oct. 28.....	do.....	11 5	7 87	1 30	0 72	10 2

## DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Frenchman River at Cross' Ranch, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.85	8.2	0.79	8.5
2.....			0.84	8.0	1.45	23.0
3.....			0.84	8.0	1.15	15.6
4.....	3.92	157.0	0.83	7.6	1.16	16.0
5.....	2.54	63.0	0.83	7.6	0.98	12.2
6.....	1.55	25.0	0.84	7.6	0.94	11.7
7.....	1.35	20.0	0.84	7.5	0.86	10.2
8.....	1.31	19.0	0.84	7.5	0.85	10.2
9.....	1.09	14.1	0.83	7.5	0.83	9.9
10.....	1.03	12.8	0.83	7.5	0.81	9.7
11.....	0.99	12.0	0.82	7.5	0.83	10.1
12.....	0.97	11.7	0.81	7.4	0.84	10.2
13.....	0.99	12.0	0.82	7.6	0.79	9.6
14.....	0.97	11.7	0.95	9.7	0.74	8.7
15.....	0.94	11.1	1.15	13.7	0.76	9.0
16.....	0.94a	10.9	1.30	17.0	0.76	9.0
17.....	0.94	10.9	1.00	10.9	0.81	9.9
18.....	0.92	10.4	0.88	8.9	0.78	9.4
19.....	0.92	10.4	0.86	8.7	0.79	9.4
20.....	0.91	10.1	0.85	8.5	1.22	18.0
21.....	0.89	9.7	0.86	8.9	0.93	11.8
22.....	0.89	9.6	0.86	8.9	0.85	10.2
23.....	0.89	9.6	0.85	8.9	0.83	9.9
24.....	0.90	9.6	0.76	7.5	0.75	8.5
25.....	0.89	9.4	0.78	8.0	0.75	8.5
26.....	0.89	9.2	1.16	15.0	0.91	11.1
27.....	0.88	9.0	0.99	11.7	0.86	10.2
28.....	0.86	8.5	0.81	8.5	0.75	8.4
29.....	0.85	8.4	0.86	9.6	0.74	8.1
30.....	0.84	8.1	0.90	10.2	0.72	7.8
31.....			0.80	8.7		

a to b Shifting conditions.

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DAILY GAUGE HEIGHT AND DISCHARGE of North Branch of Frenchman River at Cross' Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge..
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	0.79	8.9	0.76	8.1	0.64	6.4	0.74	8.1
2.	0.74	8.1	0.75	8.0	0.78	8.4	0.76	8.5
3.	0.73	7.8	0.74	7.8	0.75	8.0	0.90	11.1
4.	0.80	8.9	0.74	7.8	0.74	7.8	0.86	10.4
5.	0.74	7.8	0.73	7.6	0.74	7.8	0.84	10.2
6.	0.73	7.6	0.71	7.4	0.73	7.6	0.83	10.2
7.	0.73	7.5	0.71	7.4	0.72	7.5	0.82	10.2
8.	1.00	12.0	0.68	6.9	0.75	8.0	0.79	9.9
9.	0.85	9.4	0.67	6.8	0.80	8.7	0.75	9.4
10.	0.84	9.0	0.66	6.7	0.75	8.0	0.73	9.0
11.	0.80	8.4	0.66	6.7	0.73	7.6	0.77	9.9
12.	0.73b	7.4	0.68	6.9	0.76	8.1	0.74	9.4
13.	0.71	7.4	0.67	6.8	0.78	8.4	0.73	9.4
14.	0.74	7.8	0.67	6.8	0.81	8.9	0.73	9.4
15.	0.84	9.4	0.67	6.8	0.79	8.5	0.73	9.4
16.	0.76	8.1	0.67	6.8	0.76	8.1	0.72	9.4
17.	0.84	9.4	0.67	6.8	0.74	7.8	0.72	9.4
18.	0.90	10.4	0.68	6.9	0.74	7.8	0.72	9.4
19.	0.80	8.7	1.30	18.8	0.73	7.6	0.72	9.4
20.	0.76	8.1	0.85	9.6	0.75	8.0	0.72	9.4
21.	0.75	8.0	0.74	7.8	0.74	7.8	0.72	9.6
22.	0.74	7.8	0.73	7.6	0.73	7.6	0.72	9.6
23.	0.79	8.5	0.70	7.2	0.73a	7.5	0.72	9.6
24.	0.84	9.4	0.70	7.2	0.73	7.5	0.73	9.6
25.	0.78	8.4	0.69	7.1	0.73	7.5	0.83	11.7
26.	0.76	8.1	0.68	6.9	0.73	7.5	0.76	10.6
27.	0.94	11.1	0.67	6.8	0.74	7.8	0.75	10.6
28.	0.78	8.4	0.66	6.7	0.75	8.1	0.73	10.2
29.	0.82	9.0	0.65	6.6	0.74	8.1	0.73	10.2
30.	0.82	9.0	0.65	6.6	0.74	8.1	0.72	10.1
31.	0.76	8.1	0.64	6.4			0.72b	10.1

a-b Shifting conditions.

## MONTHLY DISCHARGE of North Branch of Frenchman River at Cross' Ranch, for 1915.

(Drainage area 53 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
April (4-30)	157.0	8.1	19.0	0.358	0.36	1,017
May	17.0	7.4	9.1	0.172	0.20	560
June	23.0	8.1	10.8	0.204	0.23	644
July	12.0	7.4	8.6	0.162	0.19	529
August	18.8	6.4	7.5	0.142	0.16	461
September	8.9	6.4	7.9	0.149	0.17	479
October	11.7	8.1	9.8	0.185	0.21	601
The period					1.52	4,281

## W. H. BARNETT DITCH NEAR EAST END.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 17, Tp. 7, Rge. 22, W. 3rd Mer., near East End Post Office.

*Gauge.*—Vertical staff, attached to a 4-inch round post driven into the bottom of the ditch about 100 feet S. 70°00'E. from the flume. Zero elevation maintained at 98.13 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark, about 1½ ft. from the right bank of the ditch and 2.0 ft. below the gauge. Assumed elevation, 100.00 feet.

*Channel.*—One channel, clay bed.

*Discharge measurements.*—Made with a weir.

*Observer.*—W. H. Barnett.

*Remarks.*—This station was established on July 26, 1915, by M. H. French. No records were obtained in 1915.

## BARROBY DITCH NEAR RAVENSCRAG.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 33, Tp. 6, Rge. 23, W. 3rd Mer.

*Gauge.*—Vertical staff, nailed to a 4-inch round post driven into the left bank of the ditch about one-quarter mile S. 12° W. of the dam. Zero elevation maintained at 97.67 feet since August 10, 1915.

*Bench-mark.*—Permanent iron bench-mark, situated 5 feet above the gauge and 1.5 feet from the right bank. Assumed elevation, 100.00 feet.

*Channel.*—One, bed of sandy loam.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Frank Barroby.

*Remarks.*—J. E. Caughey visited this station on May 13, and August 5, 1915, and reported no flow on each occasion.

## FRENCHMAN RIVER AT PHILLIPS' RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 23, Tp. 6, Rge. 23, W. 3rd Mer., at A. Phillips' ranch near Ravenscrag.

*Records available.*—July 9, 1912, to October 31, 1915.

*Gauge.*—Vertical staff. The elevation of the zero of the gauge has been 90.02 feet since the station was established.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made by wading or from cable.

*Winter flow.*—Station not maintained during winter.

*Artificial control.*—A permanent control was established at this station during October, 1914, by which means more accurate records should be obtained at this station.

*Observer.*—A. T. Phillips.

## DISCHARGE MEASUREMENTS of Frenchman River at Phillips' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 10.....	M. H. French.....	51.0	52.45	3.68	2.63	194.0
April 13.....	do.....	47.0	35.28	3.42	2.28	120.0
April 20.....	do.....	41.0	22.19	2.89	1.89	64.0
May 11.....	J. E. Caughey.....	22.0	21.10	1.35	1.55	28.0
June 16.....	do.....	25.0	24.40	1.50	1.65	37.0
July 14.....	do.....	29.0	28.85	1.72	1.76	50.0
Aug. 5.....	do.....	24.0	22.90	1.21	1.61	35.0
Aug. 25.....	do.....	23.0	18.90	1.09	1.43	21.0
Sept. 10.....	G. H. Whyte & J. E. Caughey	24.0	20.50	1.14	1.46	23.0
Sept. 25.....	J. E. Caughey.....	23.0	17.80	1.02	1.39	18.3
Oct. 14.....	do.....	25.0	20.75	1.35	1.50	28.3
Oct. 28.....	do.....	23.0	20.20	1.39	1.46	28.0

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## DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at Phillips' Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3.06	68	1.64	37	1.72	45
2			4.60	134	1.63	36	2.02	81
3			9.93	1,366	1.63	36	2.67	204
4			8.73	2,668	1.61	35	2.60	186
5			6.96	2,263b	1.61	35	2.37	136
6			4.82	945	1.61	35	2.19	106
7			3.71	498	1.58	32	2.09	91
8			3.10	308	1.57	31	2.02	81
9			2.84	244	1.58	32	1.88	63
10			2.66	200	1.55	30	1.76	49
11			2.48	159	1.59	33	1.74	47
12			2.36	135	1.52	27	1.73	46
13			2.32	128	1.55	30	1.72	45
14			2.31	123	1.65	38	1.66	39
15			2.25	115	1.81	55	1.63	41
16			2.13	96	2.00	75	1.68	41
17			2.05	85	2.12	95	1.69	42
18			2.02	81	2.38	138	1.66	39
19			1.96	73	1.87	62	1.70	43
20			1.91	66	1.72	45	2.10	92
21			1.84	58	1.70	43	2.28	120
22			1.80	54	1.67	40	2.32	127
23	3.47	10a	1.80	54	1.64	37	1.92	68
24	3.72	68	1.78	51	1.63	36	1.78	51
25	3.75	72	1.76	49	1.74	47	1.74	47
26	3.50	77						
27	3.72	80	1.74	47	1.86	60	1.76	49
28	3.49	84	1.72	45	2.06	86	1.78	51
29	3.19	80	1.70	43	1.94	70	1.86	60
30	3.19	76	1.67	40	1.86	60	1.76	49
31	3.19	74	1.64	37	1.80	54	1.74	47
	3.08	71			1.76	49		

a-b Flood and ice conditions. Discharge estimated from measurements at East End.

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at Phillips' Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.64	37	1.82	56.0	1.34	15.4	1.42	20.0
2.....	1.64	37	1.74	47.0	1.39	18.4	1.41	19.7
3.....	1.63	36	1.68	41.0	1.48	24.0	1.50	26.0
4.....	1.64	37	1.66	39.0	1.50	26.0	1.49	25.0
5.....	1.63	36	1.61	35.0	1.50	26.0	1.48	24.0
6.....	1.63	36	1.59	33.0	1.46	23.0	1.48	24.0
7.....	1.62	35	1.56	30.0	1.45	22.0	1.50	26.0
8.....	1.70	43	1.54	29.0	1.44	22.0	1.49	25.0
9.....	1.74	47	1.52	27.0	1.45	22.0	1.50	26.0
10.....	1.92	68	1.50	26.0	1.48	24.0	1.50	26.0
11.....	2.30	124	1.48	24.0	1.45	22.0	1.54	29.0
12.....	1.92	68	1.48	24.0	1.46	23.0	1.54	29.0
13.....	1.76	49	1.46	23.0	1.48	24.0	1.53	28.0
14.....	1.76	49	1.44	22.0	1.51	26.0	1.52	27.0
15.....	1.78	51	1.44	22.0	1.51	26.0	1.48	24.0
16.....	1.88	63	1.49	25.0	1.50	26.0	1.48	24.0
17.....	1.98	75	1.46	23.0	1.46	23.0	1.46	23.0
18.....	1.99	77	1.47	24.0	1.44	22.0	1.45	22.0
19.....	2.14	98	1.48	24.0	1.42	20.0	1.45	22.0
20.....	2.04	84	1.65	41.0	1.42	20.0	1.45	22.0
21.....	1.90	65	1.56	30.0	1.42	20.0	1.45	22.0
22.....	1.86	60	1.50	26.0	1.42	20.0	1.45	22.0
23.....	1.95	72	1.46	23.0	1.40	19.0	1.44	22.0
24.....	1.76	49	1.44	22.0	1.39	18.4	1.44	22.0
25.....	1.74	47	1.42	20.0	1.39	18.4	1.44	22.0
26.....	1.76	49	1.39	18.4	1.39	18.4	1.45	22.0
27.....	1.82	56	1.34	15.4	1.40	19.0	1.45	22.0
28.....	1.80	54	1.30	13.0	1.43	21.0	1.45	22.0
29.....	2.04	84	1.30	13.0	1.44	22.0	1.45	22.0
30.....	2.06	86	1.30	13.0	1.42	20.0	1.46	23.0
31.....	1.95	72	1.32	14.2			1.45	22.0

MONTHLY DISCHARGE of Frenchman River at Phillips' Ranch, for 1915.

(Drainage area 598 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	84	10.0	69	0.115	0.04	1,368
April.....	2,668	37.0	342	0.572	0.64	20,350
May.....	138	27.0	49	0.082	0.09	3,013
June.....	204	39.0	73	0.122	0.14	4,344
July.....	124	35.0	60	0.100	0.12	3,689
August.....	56	13.0	27	0.045	0.05	1,660
September.....	26	15.4	22	0.037	0.04	1,309
October.....	29	19.7	24	0.040	0.05	1,476
The period.....					1.17	37,209



## SESSIONAL PAPER No. 25c

## STRONG DITCH AT EAST END.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 25, Tp. 6, Rge. 22, W. 3rd Mer., about one-half mile below the headgate of the ditch.

*Records available.*—May 9, 1909, to December 31, 1915.

*Gauge.*—Vertical staff, fastened to a post on the right bank.

*Bench-marks.*—(1) A spike on the initial post which is about six inches above ground, on the left bank of the ditch. Elevation, 5.49 feet above the zero of the gauge. (2) The top of plug about four inches above ground on the right bank and about 50 feet downstream from the gauge. Elevation, 7.52 feet above the zero of the gauge.

*Channel.*—Slightly shifting and affected by weeds.

*Discharge measurements.*—Made by wading.

*Observer.*—John Burge.

## DISCHARGE MEASUREMENTS of Strong Ditch at East End, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 10	J. E. Caughey	16.0	18.80	0.88	1.73	16.50
June 14	do	14.0	13.60	0.80	1.55	10.90
July 8	do	13.5	10.55	0.54	1.35	5.70
Aug. 2	do	16.0	20.00	0.15	1.17	3.05
Sept. 23	do	9.0	5.80	0.52	1.22	3.04
Sept. 9	G. H. Whyte & J. E. Caughey					Nil.

## DAILY GAUGE HEIGHT AND DISCHARGE of Strong Ditch at East End, for 1915.

DAY.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge	Gauge Height.	Dis-charge
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			0.50	0.00	1.78	18.5	1.72	16.30	1.10	1.80	0.80	0.20
2			0.93	0.05	1.75	17.4	1.75	17.40	1.17 <sup>a</sup>	2.60	0.90	0.50
3			1.00	1.00	1.79	18.8	1.75	17.40	1.05	1.40	0.90	0.50
4			1.40	6.90	1.64	13.7	1.73	16.70	1.05	1.40	0.92	0.60
5			1.41	7.20	1.59	12.1	1.74	17.00	1.05	1.40	0.95	0.75
6			1.59	12.10	1.57	11.5	1.78	18.50	1.03	1.24	1.00	1.00
7			1.60	12.40	1.65	14.0	1.75	17.40	1.06	1.48	1.05	1.40
8			1.68	15.00	1.56	11.2	1.38	6.50	1.08	1.64	0.70 <sup>b</sup>	Nil
9			1.73	16.70	1.56	11.2	1.35	5.80	1.00	1.00		
10			1.70	15.60	1.54	10.7	1.36	6.00	1.04	1.32		
11			1.70	15.60	1.54	10.7	1.06	1.48	1.05	1.40		
12			1.70	15.60	1.52	10.1	1.24	3.70	1.05	1.40		
13			1.72	16.30	1.52	10.1	1.52	10.10	1.04	1.32		
14			1.80	19.20	1.55	11.0	1.53	10.40	1.02	1.16		
15			1.75	17.40	1.54	10.7	1.75	17.40	1.08	1.64		
16			1.68	15.00	1.54	10.7	1.80	19.20	1.09	1.72		
17			1.65	14.00	1.56	11.2	1.82	20.00	1.02	1.16		
18			1.60	12.40	1.58	11.8	1.90	23.00	1.04	1.32		
19			1.66	14.30	1.61	12.7	1.80 <sup>a</sup>	23.00	1.00	1.00		
20			1.70	15.60	1.65	14.0	1.95	25.00	1.00	1.00		
21			1.60	15.30	1.64	13.7	2.00	27.00	1.00	1.00		
22	0.09	0.00	1.68	15.00	1.63	13.4	1.95	25.00	1.20	3.00		
23	0.73	0.06	1.60	12.40	1.64	13.7	1.95	25.00	1.22	3.30		
24	0.78	0.16	1.65	14.00	1.60	12.4	1.93	24.00	1.24	3.70		
25	0.83	0.29	1.75	17.40	1.65	14.0	1.75	17.40	1.22	3.30		
26	0.83	0.29	1.80	19.20	1.64	13.7	1.70	15.60	1.30	4.70		
27	0.84	0.32	1.81	19.60	1.64	13.7	1.65	14.00	1.31	5.40		
28	0.92	0.60	1.84	21.00	1.69	15.3	1.50	9.50	1.19	2.90		
29	1.32	5.10	1.89	23.00	1.72	16.3	1.30	4.70	1.14	2.30		
30	0.74	0.08	1.85	21.00	1.72	16.3	1.25	3.80	1.10	1.80		
31			1.80	19.20			1.08	1.60	0.90	0.50		

a to b Beaver dams disturbed gauge readings.

c Hydrometric engineer's readings.

## MONTHLY DISCHARGE of Strong Ditch at East End, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (22-30).....	5.10	0.06	0.77	14
May.....	23.00	0.65	14.00	861
June.....	18.80	10.10	13.00	774
July.....	27.00	1.48	15.00	922
August.....	5.40	0.50	1.94	119
September (1-8).....	1.40	0.20	0.63	10
The period.....				2,700

## FRENCHMAN RIVER AT EAST END.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 31, Tp. 6, Rge. 21, W. 3rd Mer., at the Canadian Pacific Railway bridge about one-half mile east of the East End depot.

*Records available.*—April 21, 1909, to October 31, 1915.

*Gauge.*—Vertical staff fastened to the downstream pile of the fifth bent from the west end of the bridge. The elevation of the zero of the gauge is 2958.84 feet above sea level.

*Bench-mark.*—On July 31, 1915, a permanent iron bench-mark was set on the left bank above high water mark, 30 feet from the edge of the cut-bank and near the gate on the Royal Northwest Mounted Police grounds. Referring to the Canadian Pacific Railway datum the elevation is 2975.19 feet above sea level.

*Channel.*—Permanent.

*Discharge measurements.*—Made by wading or from a bridge.

*Winter flow.*—Station not maintained in winter.

*Artificial control.*—A permanent control for the gauge was established during October, 1914, one-quarter mile downstream from the gauge at the bridge.

*Diversions.*—Mr. J. C. Strong diverts water for irrigation purposes about two miles upstream from this station. A small amount returns to the river channel, above the gauge.

*Observers.*—S. B. C. Gooch and John Burge.

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## DISCHARGE MEASUREMENTS of Frenchman River at East End, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 16.....	M. H. French.....	21.0	17.15	1.06	3.20	18.2
Mar. 25.....	do.....	24.0	32.90	2.34	3.50	77.0
Mar. 27.....	do.....	47.0	36.05	2.33	3.30	84.0
April 1.....	do.....	27.0	33.05	2.04	3.02	68.0
April 2.....	do.....	47.0	72.40	1.89	3.65	137.0
April 4.....	do.....	96.3	551.20	4.98	10.35	2,750.0
April 5.....	do.....	37.3	428.70	4.76	9.35	2,042.0
April 6.....	do.....	37.3	291.00	3.68	5.95	1,070.0
April 9.....	do.....	65.0	65.75	3.89	3.09	256.0
April 14.....	do.....	60.0	37.30	3.57	2.52	134.0
April 15.....	do.....	61.0	38.18	2.67	2.50	141.0
April 19.....	do.....	53.0	55.73	1.46	2.16	82.0
May 8.....	J. E. Caughey.....	17.0	8.75	1.71	1.43	15.0
June 14.....	do.....	21.0	15.40	2.60	1.72	40.0
July 8.....	do.....	21.0	14.80	2.48	1.67	37.0
July 30.....	do.....	21.0	26.70	3.02	2.11	81.0
Aug. 21.....	do.....	20.0	14.05	2.47	1.69	35.0
Sept. 9.....	G. H. Whyte and J. E. Caughey.	20.0	10.55	2.72	1.58	29.0
Sept. 22.....	J. E. Caughey.....	17.5	9.50	2.18	1.52	21.0
Oct. 12.....	do.....	19.5	12.75	2.52	1.65	32.0
Oct. 26.....	do.....	17.5	9.97	2.84	1.56	28.0

## DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at East End, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.04	68.0	1.83	49.0	1.63	31
2.....			3.73	154.0	1.43	16.4	2.50	142
3.....			7.79	1366.0	1.40	14.4	2.61	162
4.....			10.32	2669.0	1.41	15.1	2.62	164
5.....			9.66	2263.0	1.40	14.4	2.59	158
6.....			5.70	975.0	1.40	14.4	2.38	120
7.....			4.48	594.0	1.38	13.3	2.15	84
8.....			3.46	335.0	1.43	16.4	2.13	81
9.....			3.06	252.0	1.46	18.4	1.99	65
10.....			2.92	224.0	1.47	19.0	2.00	66
11.....			2.71	182.0	1.45	17.7	1.98	64
12.....			2.55	151.0	1.43	16.4	1.96	62
13.....			2.46	135.0	1.42	15.7	1.85	51
14.....			2.50	142.0	1.54	24.0	1.72	39
15.....			2.48	138.0	2.25	98.0	1.71	38
16.....	3.20	18.2	2.00a	66.0	2.94	228.0	1.72	39
17.....	3.20c	18.2	2.52b	146.0	2.05	72.0	1.67	35
18.....	3.10	19.2	2.24	96.0	2.15	84.0	1.62	30
19.....	3.00	17.2	2.16	85.0	2.05	72.0	1.66	34
20.....	3.00	19.8	2.14	82.0	1.74	41.0	1.87	53
21.....	2.90	26.0	2.10	77.0	1.70	37.0	2.17	86
22.....	2.90	20.0h	2.01	67.0	1.69	36.0	2.35	118
23.....	3.30	68.0h	1.62	30.0	1.67	35.0	2.22	93
24.....	4.36	134.0	1.42	15.7	1.40	14.4	2.21	92
25.....	3.63	77.0	1.46	18.4	1.47	19.0	2.24	96
26.....	3.25	55.0	1.80	46.0	1.81	47.0	2.22	93
27.....	3.35	84.0	1.79	46.0	1.80	46.0	1.62	39
28.....	3.07	80.0h	1.76	43.0	1.93	61.0	2.63	68
29.....	3.00	76.0h	1.70	37.0	1.98	64.0	2.01	67
30.....	2.90	74.0h	1.95	61.0	1.95	61.0	2.03	69
31.....	2.76	71.0h			1.87	53.0		

a Flash boards put in dam.

b Flash boards went out.

c Gauge height and discharge interpolated.

h Discharge interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at East End, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.79	45	2.02	68.0	1.44	17.0	1.54	24
2	1.75 <sup>d</sup>	42	1.97	63.0	1.45	17.7	1.53	23
3	1.72	39	1.95	61.0	1.47	19.0	1.55	25
4	1.71	38	1.87	53.0	1.47	19.0	1.53	23
5	1.71	38	1.83	49.0	2.35	115.0	1.53	23
6	1.74	41	1.72	39.0	2.05	72.0	1.55	25
7	1.77	44	1.71	38.0	1.75	42.0	1.54	24
8	1.70	37	1.72	39.0	1.64	32.0	1.54	24
9	1.76	43	1.62	30.0	1.60	29.0	1.55	25
10	1.77	44	1.60	29.0	1.56	26.0	1.55	25
11	2.07	74	1.55	25.0	1.58	27.0	1.55	25
12	2.02	68	1.55	25.0	1.60	29.0	1.55	25
13	1.97	63	1.52	23.0	1.60	29.0	1.60	29
14	1.87	53	1.52	23.0	1.59	28.0	1.61	30
15	1.90	56	1.51	22.0	1.61	30.0	1.60	29
16	1.90	56	1.51	22.0	1.60	29.0	1.60	29
17	1.92	58	1.52	23.0	1.60	29.0	1.60	29
18	1.95	61	1.51	22.0	1.58	27.0	1.58	27
19	1.97	63	1.51	22.0	1.62	30.0	1.58	27
20	2.17	86	1.51	22.0	1.65	33.0	1.55	25
21	2.12	80	1.69	36.0	1.60	29.0	1.58	27
22	2.10	77	1.67	35.0	1.55	25.0	1.56	26
23	2.05	72	1.64	32.0	1.54	24.0	1.55	25
24	2.02	68	1.56	26.0	1.55	25.0	1.53	23
25	1.97	63	1.54	24.0	1.53	23.0	1.53	23
26	1.97	63	1.49	20.0	1.53	23.0	1.55	25
27	1.95	61	1.47	19.0	1.54	24.0	1.57	26
28	1.92	58	1.47	19.0	1.54	24.0	1.57	26
29	1.92	58	1.45	17.7	1.55	25.0	1.56	26
30	2.05	72	1.45	17.7	1.54	24.0	1.54	24
31	2.13	81	1.44	17.0	.....	.....	1.54	24

<sup>d</sup> Gauge height interpolated.

## MONTHLY DISCHARGE of Frenchman River at East End, for 1915.

(Drainage area 648 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (16-31)	134	17.2	54	0.083	0.05	1,714
April	2,668	15.9	352	0.543	0.61	20,945
May	243	15.4	57	0.088	0.10	3,505
June	181	42.0	91	0.140	0.16	5,415
July	111	44.0	73	0.113	0.13	4,489
August	70	17.5	33	0.051	0.06	2,029
September	116	17.2	31	0.048	0.05	1,845
October	30	23.0	26	0.040	0.05	1,599
The period	.....	.....	.....	.....	1.21	41,541

NOTE.—This table shows the total discharge of the river and Strong's Ditch at this point.

## SESSIONAL PAPER No. 25c

## MORRISON BROTHERS DITCH FROM FRENCHMAN RIVER.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 26, Tp. 6, Rge. 21, W. 3rd Mer., about three miles downstream from East End.

*Records available.*—June 12 to August 28, 1913; May 25 to October 30, 1914; May 12 to June 27, 1915.

*Gauge.*—Vertical staff fastened to a post at the right bank about one-half mile from the headgate. The elevation of the zero of the gauge has been maintained at 97.36 feet since established.

*Bench-mark.*—Top of rock marked Bench-Mark in red, located on the left bank about three hundred feet upstream from the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Slightly grown with weeds.

*Discharge measurements.*—Made with meter.

*Observer.*—A. A. Morrison.

## DISCHARGE MEASUREMENTS of Morrison Brothers Ditch from Frenchman River, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
May 10.....	J. E. Caughey.....	6.0	3 80	0.53	0.25	2.03
June 14.....	do.....	7.0	7 20	0.54	0.63	3.90
July 9.....	do.....	6.2	4.35	0.52	0.43	2.30
July 30.....	do.....					Nil.

## DAILY GAUGE HEIGHT AND DISCHARGE of Morrison Brothers Ditch from Frenchman River, for 1915.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1 08	8 6
2.....			1 08	8 6
3.....			1 08	8 6
4.....				
5.....				
6.....				
7.....				
8.....				
9.....				
10.....				
11.....				
12.....				
13.....	0 50 <sup>b</sup>	2 8		
14.....	0 50	2 8	0 50 <sup>b</sup>	2 8
15.....	0 58	3 5	0 50	2 8
16.....	0 79 <sup>a</sup>	5 4	0 50	2 8
17.....	1 00	7 6	0 50	2 8
18.....	1 00	7 6	0 50	2 8
19.....	1 08	8 6	0 50	2 8
20.....	1 08	8 6	1 00	6 8
21.....	0 83	5 9	1 00	6 8
22.....	0 83	5 9	1 08	8 6
23.....	0 75	5 0	1 00	6 8
24.....	0 67	4 3	0 96 <sup>a</sup>	7 2
25.....	0 50	2 8	0 92	6 8
26.....	0 50	2 8	0 92	6 8
27.....	0 92	6 8	0 83	5 9
28.....	0 92	6 8	0 83	5 9
29.....	1 00	7 6		
30.....	1 00	7 6		
31.....	1 03 <sup>a</sup>	8 0		
	1 06 <sup>a</sup>	8 3		

*a* Gauge height interpolated.

*b* Headgate opened.

*c* Headgate closed.

## MONTHLY DISCHARGE of Morrison Brothers Ditch from Frenchman River, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May (12-31).....	8.60	2.80	6.00	238
June { 1-3 }.....	8.60	2.80	5.90	211
June { 13-27 }.....				
The period.....				449

## MULE CREEK AT GUNN'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 33, Tp. 5, Rge. 17, W. 3rd Mer.

*Records available.*—April 15, 1914, to October 31, 1915. Previous records at old station about one-half mile downstream from present site consist of discharge measurements made during 1911, 1912 and 1913.

*Gauge.*—Vertical staff. Zero elevation has been maintained at 92.46 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark, assumed elevation 100.00 feet.

*Discharge measurements.*—Made with meter; with weir at low stages.

*Channel.*—Probably permanent.

*Winter flow.*—This station is not maintained during the winter.

*Diversions.*—There is no diversion above this station.

*Observer.*—Wm. Gunn, Jr.

## DISCHARGE MEASUREMENTS of Mule Creek at Gunn's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 20.....	F. R. Steinberger.....				0.11	0.24
May 26.....	do.....	8.6	9.3	0.70	1.84	6.50
June 29.....	do.....				0.15	0.38
July 30.....	do.....				0.14	0.34
Aug. 21.....	do.....				0.06	0.10
Oct. 8.....	do.....				0.16	0.42

## SESSIONAL PAPER No. 25c

## DAILY GAUGE HEIGHT AND DISCHARGE of Mule Creek at Gunn's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			5.30	35.00	0.57	0.14	0.46	1.98
2.....			7.50	40.00 <sup>a</sup>	0.59	0.16	2.10	8.60
3.....			8.50	60.00	0.60	0.17	1.75	5.80
4.....			6.50	44.00	0.57	0.14	1.45	3.60
5.....			3.50	19.80	0.59	0.16	0.40 <sup>b</sup>	1.62
6.....			2.33	10.40	0.58	0.15	0.30 <sup>b</sup>	1.06
7.....			2.35	10.60	0.57	0.14	0.35 <sup>b</sup>	1.33
8.....			2.30	10.20	0.56	0.13	0.30 <sup>b</sup>	1.06
9.....			2.20	9.40	0.60	0.17	0.25 <sup>b</sup>	0.81
10.....			2.08	8.40	0.62	0.20	0.21 <sup>b</sup>	0.63
11.....			2.10	8.60	0.59	0.16	0.18 <sup>b</sup>	0.50
12.....			1.98	7.60	0.61	0.19	0.15 <sup>b</sup>	0.38
13.....			1.22	2.10	0.58	0.15	0.11 <sup>b</sup>	0.24
14.....			1.12	1.65	1.42	3.30	0.16 <sup>b</sup>	0.42
15.....			1.02	1.24	1.52	4.00	0.20 <sup>b</sup>	0.58
16.....			0.73	0.40	1.62	4.80	0.22 <sup>b</sup>	0.67
17.....			0.55	0.12	1.32	2.70	0.23 <sup>b</sup>	0.72
18.....			0.59	0.16	0.86	0.72	0.20 <sup>b</sup>	0.58
19.....			0.61	0.19	0.77	0.48	0.35 <sup>b</sup>	1.33
20.....	4.00	4 <sup>a</sup>	0.62	0.20	0.11 <sup>b</sup>	0.24	0.25 <sup>b</sup>	0.81
21.....	4.10	6	0.57	0.14	0.13 <sup>b</sup>	0.31	0.23 <sup>b</sup>	0.72
22.....	7.20	8	0.59	0.16	0.30 <sup>b</sup>	1.06	0.20 <sup>b</sup>	0.58
23.....	6.20	7	0.61	0.19	0.40 <sup>b</sup>	1.62	0.25 <sup>b</sup>	0.81
24.....	5.80	8	0.59	0.16	1.52	4.00	0.20 <sup>b</sup>	0.58
25.....	5.40	10	0.62	0.20	0.31 <sup>b</sup>	1.11	0.30 <sup>b</sup>	1.06
26.....	4.10	12	0.60	0.17	1.84	6.50	2.65	13.00
27.....	3.80	14	0.58	0.15	0.18 <sup>b</sup>	0.50	1.65	5.00
28.....	4.30	16	0.55	0.12	0.20 <sup>b</sup>	0.58	0.50 <sup>b</sup>	2.24
29.....	5.00	18	0.56	0.13	1.80	6.20	0.50 <sup>b</sup>	2.24
30.....	5.50	24	0.58	0.15	0.30	1.06	0.45 <sup>b</sup>	1.92
31.....	5.15	20			0.40	1.62		

<sup>a</sup> to <sup>a</sup> Estimated.<sup>b</sup> Weir measurement.



DAILY GAUGE HEIGHT AND DISCHARGE of Mule Creek at Gunn's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.47b	2.04	0.15b	0.38	0.49	0.06	0.75	0.44
2.....	0.45b	1.92	0.16b	0.42	0.46	0.04	0.88	0.77
3.....	0.47b	2.05	0.12b	0.27	0.47	0.05	0.28b	0.96
4.....	0.45b	1.92	0.10b	0.21	0.45	0.04	0.25b	0.81
5.....	0.43b	1.80	1.50	3.90	0.46	0.04	0.35b	1.33
6.....	0.45b	1.92	1.30	2.60	0.44	0.04	0.58	2.74
7.....	0.50b	2.24	1.40	3.20	0.80	0.55	0.48b	2.11
8.....	0.44b	1.86	0.60	0.17	0.65	0.25	0.16b	0.42
9.....	0.38b	1.50	0.50	0.06	0.40	0.02	0.17b	0.46
10.....	0.30b	1.06	0.45	0.04	0.50	0.06	0.19b	0.54
11.....	0.20b	0.58	0.43	0.03	0.50	0.06	0.20b	0.58
12.....	0.15b	0.38	0.40	0.02	0.60	0.17	0.18b	0.50
13.....	0.11b	0.24	0.44	0.04	0.95	0.99	0.17b	0.46
14.....	0.12b	0.27	0.48	0.05	1.00	1.16	0.14b	0.34
15.....	0.15b	0.38	0.53	0.09	1.10	1.56	0.16b	0.42
16.....	0.18b	0.50	0.50	0.06	0.99	1.13	0.18b	0.50
17.....	0.21b	0.63	0.40	0.02	0.98	1.09	0.18b	0.50
18.....	0.28b	0.96	0.45	0.04	0.95	0.99	0.15b	0.38
19.....	0.20b	0.58	0.48	0.05	0.70	0.33	0.64	0.23
20.....	0.30b	1.06	0.48	0.05	0.65	0.25	0.67	0.28
21.....	0.43b	1.80	0.53	0.09	0.63	0.22	0.65	0.25
22.....	0.40b	1.62	0.58	0.15	0.60	0.17	0.69	0.31
23.....	0.20b	0.58	0.60	0.17	0.57	0.14	0.67	0.28
24.....	1.77	6.00	0.55	0.12	0.55	0.12	0.63	0.22
25.....	0.20b	0.58	0.52	0.08	0.68	0.30	0.62	0.20
26.....	1.46	3.60	0.48	0.05	0.63	0.22	0.60	0.17
27.....	0.25b	0.81	0.44	0.04	0.60	0.17	0.63	0.22
28.....	0.15b	0.38	0.40	0.02	0.65	0.25	0.65	0.25
29.....	0.35b	1.33	0.43	0.03	0.67	0.28	0.67	0.28
30.....	0.14b	0.34	0.46	0.04	0.75	0.44	0.62	0.20
31.....	0.12b	0.27	0.48	0.05	.....	.....	0.64	0.23

b Weir measurement.

## MONTHLY DISCHARGE of Mule Creek at Gunn's Ranch, for 1915.

(Drainage area 60 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (20-31).....	24.00	4.00	12.20	0.203	0.09	290
April.....	60.00	0.12	9.10	0.152	0.18	541
May.....	6.50	0.13	1.39	0.023	0.03	85
June.....	13.00	0.24	2.00	0.033	0.04	119
July.....	6.00	0.24	1.32	0.022	0.02	81
August.....	3.90	0.02	0.40	0.007	0.01	25
September.....	1.56	0.02	0.37	0.006	0.01	22
October.....	2.70	0.17	0.56	0.009	0.01	34
The period.....	.....	.....	.....	.....	0.39	1,197

## BATE CREEK AT BATE'S RANCH.

*Location.*—On NW.  $\frac{1}{4}$  Sec. 6, Tp. 6, Rge. 16, W. 3rd Mer., near Nummola Post Office.*Records available.*—April 15 to October 31, 1915.*Gauge.*—Vertical staff, fastened to a post on right bank about one-quarter mile from Mr. Bate's house. The elevation of the zero maintained 94.87 feet in 1914, and 92.77 feet in 1915.*Bench-mark.*—Wooden plug driven in the left bank 36 feet from the gauge. Assumed elevation, 100.00 feet.

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*Channel.*—Probably permanent.

*Discharge measurements.*—Made with meter and weir.

*Diversions.*—Mr. Bate diverts water for irrigation purposes above the gauge.

*Observer.*—A. E. Bate.

## DISCHARGE MEASUREMENTS of Bate Creek at Bate's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 11.....	F. R. Steinberger.				1.270	0.277b
May 20.....	do				0.115a	0.255b
May 26.....	do				0.270a	0.908b
May 31.....	do				0.135a	0.327b
June 25.....	do				0.115a	0.255b
June 26.....	do				0.190a	0.539b
June 29.....	do				0.120a	0.273b
July 27.....	do				0.140a	0.344b
July 28.....	do				0.120a	0.273b
July 30.....	do				0.120a	0.273b
Aug. 21.....	do				0.100a	0.209b
Aug. 23.....	do				0.090a	0.176b
Aug. 25.....	do				0.120a	0.273b
Sept. 14.....	do				0.150a	0.381b
Sept. 16.....	do				0.150a	0.381b
Oct. 4.....	do				0.140a	0.341b
Oct. 6.....	do				0.140a	0.341b
Oct. 7.....	do				0.150a	0.381b

a Weir gauge rod.

b Weir measurements.

## DAILY GAUGE HEIGHT AND DISCHARGE of Bate Creek at Bate's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.83	1.59	1.24	0.25	0.16	0.42
2.....			2.78	4.70	1.24	0.25	0.25	0.81
3.....			2.40	3.40	1.24	0.25	0.18	0.50
4.....			1.79	1.47	1.24	0.25	0.14	0.34
5.....			1.78	1.44	1.23	0.24	0.16	0.42
6.....			1.58	0.89	1.23	0.24	0.14	0.34
7.....			1.50	0.69	1.23	0.24	0.13	0.31
8.....			1.54	0.79	1.22	0.22	0.14	0.34
9.....			1.54	0.79	1.22	0.22	0.12	0.27
10.....			1.48	0.65	1.22	0.22	0.14	0.34
11.....			1.48	0.65	1.24	0.25	0.12	0.27
12.....			1.45	0.58	1.25	0.26	0.11	0.24
13.....			1.52	0.74	1.28	0.31	0.10	0.21
14.....			1.56	0.84	1.56	0.84	0.10	0.21
15.....			1.38	0.45	1.43	0.54	0.11	0.24
16.....			1.40	0.48	1.35	0.40	0.14	0.34
17.....			1.37	0.43	1.30	0.32	0.14	0.34
18.....			1.31	0.34	1.28	0.31	0.11	0.24
19.....			1.32	0.35	1.24	0.25	0.19	0.54
20.....			1.32	0.35	1.25	0.26	0.16	0.42
21.....			1.28	0.30	0.12a	0.27	0.12	0.27
22.....			1.27	0.28	0.11	0.24	0.10	0.21
23.....	2.80	4.90	1.26	0.27	0.12	0.27	0.10	0.21
24.....	2.40	3.60	1.27	0.28	0.12	0.27	0.09	0.18
25.....	2.34	3.20	1.26	0.27	0.15	0.38	0.08	0.13
26.....	2.08	2.40	1.25	0.26	0.26	0.86	0.30	1.06
27.....	2.01	2.10	1.25	0.26	0.18	0.50	0.12	0.27
28.....	2.00	2.10	1.24	0.25	0.12	0.27	0.12	0.27
29.....	1.90	1.80	1.24	0.25	0.16	0.42	0.11	0.24
30.....	1.82	1.50	1.24	0.25	0.14	0.34	0.13	0.31
31.....	1.72	1.27			0.12	0.27		

a New weir gauge rod from May 21.

DAILY GAUGE HEIGHT AND DISCHARGE OF Bate Creek at Bate's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.14	0.34	0.08	0.15	0.08	0.15	0.13	0.31
2.....	0.10	0.21	0.09	0.18	0.12	0.27	0.14	0.34
3.....	0.12	0.27	0.10	0.21	0.10	0.21	0.22	0.67
4.....	0.12	0.27	0.08	0.15	0.10	0.21	0.14	0.34
5.....	0.10	0.21	0.06	0.10	0.10	0.21	0.14	0.34
6.....	0.14	0.34	0.06	0.10	0.08	0.15	0.14	0.34
7.....	0.12	0.27	0.06	0.10	0.11	0.24	0.14	0.34
8.....	0.10	0.21	0.05	0.07	0.10	0.21	0.14	0.34
9.....	0.12	0.27	0.06	0.10	0.10	0.21	0.12	0.27
10.....	0.12	0.27	0.05	0.07	0.11	0.24	0.14	0.34
11.....	0.10	0.21	0.05	0.07	0.12	0.27	0.14	0.34
12.....	0.08	0.15	0.06	0.10	0.14	0.34	0.12	0.27
13.....	0.10	0.21	0.05	0.07	0.14	0.34	0.11	0.24
14.....	0.16	0.42	0.05	0.07	0.12	0.27	0.10	0.21
15.....	0.12	0.27	0.06	0.10	0.10	0.21	0.12	0.27
16.....	0.10	0.21	0.04	0.05	0.10	0.21	0.11	0.24
17.....	0.23	0.72	0.06	0.10	0.10	0.21	0.12	0.27
18.....	0.18	0.50	0.06	0.10	0.10	0.21	0.12	0.27
19.....	0.14	0.34	0.12	0.27	0.12	0.27	0.11	0.24
20.....	0.11	0.24	0.08	0.15	0.12	0.27	0.12	0.27
21.....	0.10	0.21	0.08	0.15	0.12	0.27	0.12	0.27
22.....	0.08	0.15	0.08	0.15	0.12	0.27	0.11	0.24
23.....	0.14	0.34	0.09	0.18	0.10	0.21	0.12	0.27
24.....	0.12	0.27	0.07	0.12	0.11	0.24	0.11	0.24
25.....	0.11	0.24	0.08	0.15	0.10	0.21	0.12	0.27
26.....	0.12	0.27	0.07	0.12	0.10	0.21	0.11	0.24
27.....	0.10	0.21	0.08	0.15	0.12	0.27	0.11	0.24
28.....	0.10	0.21	0.08	0.15	0.12	0.27	0.10	0.21
29.....	0.16	0.42	0.06	0.10	0.12	0.27	0.12	0.27
30.....	0.10	0.21	0.08	0.15	0.12	0.27	0.11	0.24
31.....	0.10	0.21	0.08	0.15	.....	.....	0.12	0.27

## MONTHLY DISCHARGE OF Bate Creek at Bate's Ranch, for 1915.

(Drainage area 12 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31).....	4.90	1.27	2.55	0.212	0.07	46
April.....	4.70	0.25	0.81	0.068	0.08	48
May.....	0.86	0.22	0.33	0.028	0.03	20
June.....	1.06	0.15	0.34	0.029	0.03	20
July.....	0.72	0.15	0.28	0.023	0.03	17
August.....	0.27	0.05	0.12	0.010	0.01	7
September.....	0.34	0.15	0.24	0.020	0.02	14
October.....	0.67	0.21	0.29	0.024	0.03	18
The period.....	.....	.....	.....	.....	0.30	190

## FRENCHMAN RIVER AT "76" RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  of Sec. 27, Tp. 5, Rge. 16, W. 3rd Mer., at the "76" ranch near Waldville Post Office.

*Records available.*—April 10, 1914, to October 11, 1915.

*Gauge.*—Vertical staff. Zero elevation has been maintained at 87.95 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Probably permanent.

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*Discharge Measurements.*—Made by wading or from cable.

*Winter flow.*—Station not maintained during winter.

*Diversions.*—Messrs. Morrison Brothers, Duncan and Watson, divert water from the stream some fifty miles above the station.

*Observer.*—S. D. Lowry.

## DISCHARGE MEASUREMENTS of Frenchman River at "76" Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 10.....	F. R. Steinberger.....	28	22.8	1.06	2 10	24
May 19.....	do.....	39	38 2	1.05	2 43	59
May 21.....	do.....	64	63.0	1.24	2 55	78
May 25.....	do.....	45	39.6	1.02	2 28	40
June 1.....	do.....	39	34.8	1.66	2 42	58
June 23.....	do.....	62	55.8	1.32	2 34	74
June 24.....	do.....	68	54.6	1.53	2 32	129
June 28.....	do.....	38	32.3	1.59	2 37	51
July 3.....	do.....	38	33.9	1 52	2 37	52
July 26.....	do.....	40	40.8	1.60	2 48	65
July 29.....	do.....	39	37.0	1.46	2 39	54
Aug. 20.....	do.....	35	29 5	1.07	2 08	23
Aug. 26.....	do.....	36	21.6	1.15	2 13	28
Sept. 17.....	do.....	33	26.4	1.18	2 17	31
Sept. 30.....	do.....	32	24 4	0 87	2 11	21
Oct. 3.....	do.....	35	25.6	1.23	2 21	31
Oct. 9.....	do.....	33	25.2	1.20	2 19	30

## DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at "76" Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2 24	34	2 67	98	2 41	55
2.....			3 85	392	2 61	87	2 40	53
3.....			4 08	455	2 47	64	2 70	104
4.....			3 45	284	2 49	66	2 50	68
5.....			7 72	1 437	2 48	65	2 70	104
6.....			7 37	1 343	2 42	56	3 80	379
7.....			8 98	1 778	2 27	37	3 70	352
8.....			5 37	803	2 09	22	3 18	213
9.....			4 71	625	2 10	22	2 90	147
10.....			3 65	339	2 10	22	2 70	104
11.....			3 42	276	2 09	22	2 50	68
12.....			3 42	276	b		3 60	83
13.....			3 29 <sup>a</sup>	241			2 50	68
14.....			3 15	206			2 40	53
15.....			3 10	194			2 30	40
16.....			2 95	158			2 20	39
17.....			2 83	132			2 18	28
18.....			2 80	125	2 35	46	2 18	28
19.....			2 75	114	2 44	59	2 30	40
20.....			2 85	136	2 46	62	2 29	39
21.....			2 86	138	2 54	75	2 50	36
22.....			2 73	110	2 48 <sup>a</sup>	65	2 34	43
23.....			2 70	104	2 42 <sup>a</sup>	56	2 40	53
24.....	2 00	17 2	2 65	95	2 34	45	2 52	178
25.....	2 05	19 8	2 60	85	2 28	38	2 70	104
26.....	2 26	36 0	2 50	68	2 34	45	2 72	178
27.....	1 90	12 5	2 88	46	2 31	41	2 17	24
28.....	2 15	26 0	2 49	66	2 32 <sup>a</sup>	43	2 39	68
29.....	2 37	49 0	2 48	6	2 33 <sup>a</sup>	44	2 4	43
30.....	2 29	39 0	2 47	64	2 34	48	2 55	49
31.....	2 19	29 0			2 29	49		

<sup>a</sup> Interpolated.

<sup>b</sup> to <sup>c</sup> Gauge heights not available.

DAILY GAUGE HEIGHT AND DISCHARGE OF Frenchman River at "76" Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.31	41	2.40	53	<i>b</i>		2.09	22
2.....	2.30	40	2.38	50			2.10	22
3.....	2.29	39	2.40	53			2.20	30
4.....	2.30	40	2.42	56			2.20	30
5.....	2.30	40	2.19	29			2.20 <sub>a</sub>	30
6.....	2.20	30	2.14	26			2.20	30
7.....	2.29	39	2.10	22			2.19	29
8.....	2.30	40	2.23	33			2.19	29
9.....	2.30	40	2.21	31			2.19	29
10.....	2.39	52	2.20	30	<i>c</i>		2.20	30
11.....	2.60	85	2.18	28	2.09	22	2.20	30
12.....	2.50	68	2.12	24	2.12	24		
13.....	2.53	73	2.08	21	2.10	22		
14.....	2.70	104	2.06	20	2.12 <sub>a</sub>	24		
15.....	2.70	104	2.05	20	2.14 <sub>a</sub>	26		
16.....	2.57	80	2.05	20	2.15	26		
17.....	2.70	104	2.05	20	2.17	28		
18.....	2.50	68	2.06	20	2.17	28		
19.....	2.53	73	2.11	23	<i>b</i>			
20.....	2.50	68	2.12	24				
21.....	2.56	78	2.09	22				
22.....	2.67	98	2.07	21				
23.....	2.66	96	2.09	22				
24.....	2.56	78	2.09	22				
25.....	2.50	68	2.09	22				
26.....	2.46	62	2.13	25				
27.....	2.50	68	2.13	25				
28.....	2.42	56	2.13	25				
29.....	2.43	58	2.12 <sub>a</sub>	24	<i>c</i>			
30.....	2.38	50	2.12 <sub>a</sub>	24	2.11	23		
31.....	2.42	56	2.12 <sub>a</sub>	24				

*a* Interpolated.*b* to *c* Gauge heights not available.

## MONTHLY DISCHARGE of Frenchman River at "76" Ranch, for 1915.

(Drainage area 1,106 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (24-31).....	49	12.5	28	0.025	0.01	444
April.....	1,437	34.0	340	0.307	0.34	20,231
May (1-11 and 18-31).....	98	22.0	51	0.046	0.04	2,529
June.....	379	28.0	92	0.083	0.09	5,474
July.....	104	30.0	64	0.058	0.07	3,935
August.....	56	20.0	28	0.025	0.03	1,722
September (11-18 and 30).....	28	22.0	25	0.023	0.01	446
October (1-11).....	30	22.0	28	0.025	0.01	611
The period.....					0.30	35,392

## SNAKE CREEK NEAR VAL MARIE.

*Location.*—On SW.  $\frac{1}{4}$  of Sec. 16, Tp. 4, Rge. 13, W. 3rd Mer., about one-half mile east of Val Marie Post Office.

*Records available.*—April 7, 1914, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation has been maintained at 87.91 feet since establishment.

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*Bench-mark.*—Permanent iron bench-mark, located three feet north of the east tower of the cable. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made from cable and by weir.

*Observer.*—Jean Denniel.

## DISCHARGE MEASUREMENTS of Snake Creek near Val Marie, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 7	F. R. Steinberger				0.59	0.39 <sub>a</sub>
May 22	do				0.60	0.39 <sub>a</sub>
June 4	do	2.6	1.04	1.13	0.89	1.18
June 21	do				0.70	0.50 <sub>a</sub>
July 7	do				0.60	0.35 <sub>a</sub>
July 24	do				0.50	0.28 <sub>a</sub>
Aug. 2	do				0.60	0.36 <sub>a</sub>
Aug. 17	do				0.45	0.09 <sub>a</sub>
Aug. 28	do				0.42	0.05 <sub>a</sub>
Sept. 10	do				0.53	0.28 <sub>a</sub>
Sept. 19	do				0.65	0.25 <sub>a</sub>
Sept. 29	do				0.64	0.28 <sub>a</sub>
Oct. 12	do				0.64	0.30 <sub>a</sub>

*a* Weir measurements.

## DAILY GAUGE HEIGHT AND DISCHARGE of Snake Creek near Val Marie, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			4.37	14.00	0.57	0.24	0.92	1.32
2			5.89	22.00 <sub>a</sub>	0.57	0.24	0.90	1.23
3			6.87	28.00	0.57	0.24	0.89	1.19
4			5.39	21.00	0.58	0.26	0.88	1.14
5			4.11	15.70	0.59	0.28	0.81	0.84
6			3.50	12.90	0.60	0.29	0.69	0.48
7			3.09	11.10	0.59	0.28	0.65	0.39
8			2.57	8.70	0.59	0.28	0.67	0.44
9			2.12	6.70	0.58	0.26	0.65	0.49
10			1.79	5.20	0.58	0.26	0.63	0.35
11			1.52	4.00	0.58	0.26	0.60	0.29
12			1.32	3.10	0.58	0.26	0.59	0.28
13			1.11	2.20	0.59	0.28	0.59	0.28
14			1.01	1.72	0.62	0.33	0.63	0.35
15			0.99	1.64	0.65	0.39	0.60	0.29
16			0.87	1.10	0.69	0.48	0.57	0.24
17			0.85	1.01	0.67	0.44	0.65	0.39
18			0.82	0.89	0.66	0.42	0.61	0.31
19			0.79	0.77	0.62	0.33	0.62	0.32
20			0.72	0.56	0.59	0.28	0.65	0.39
21			0.72	0.56	0.57	0.24	0.71	0.53
22			0.71	0.53	0.59	0.28	0.72	0.56
23		3 <sub>a</sub>	0.72	0.56	0.57	0.24	0.75	0.65
24	3.52	8	0.72	0.56	0.55	0.22	0.76	0.68
25	3.69	10	0.69	0.48	0.54	0.20	0.70	0.50
26	3.37	9	0.67	0.44	0.69	0.48	0.67	0.44
27	3.33	9	0.65	0.39	0.75	0.65	0.68	0.46
28	3.37	9	0.63	0.35	0.75	0.65	0.69	0.48
29	2.92	8	0.61	0.31	0.70	0.50	0.68	0.46
30	3.27	10	0.61	0.31	0.90	1.50	0.68	0.46
31	4.27	12			0.95	1.45		

*a* to *a* Estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Snake Creek near Val Marie, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.64	0.37	0.57	0.24	0.44	0.08	0.65	0.39
2.....	0.65	0.39	0.56	0.23	0.45	0.09	0.66	0.42
3.....	0.65	0.39	0.57	0.24	0.45	0.09	0.75	0.65
4.....	0.66	0.42	0.57	0.24	0.45	0.09	0.74	0.62
5.....	0.63	0.35	0.55	0.22	0.45	0.09	0.73	0.59
6.....	0.61	0.31	0.53	0.18	0.45	0.09	0.70	0.50
7.....	0.60	0.29	0.51	0.16	0.47	0.11	0.68	0.46
8.....	0.64	0.37	0.52	0.17	0.51	0.16	0.65	0.39
9.....	0.62	0.33	0.51	0.16	0.52	0.17	0.65	0.39
10.....	0.61	0.31	0.50	0.14	0.53	0.18	0.64	0.37
11.....	0.60	0.29	0.48	0.12	0.56	0.23	0.64	0.37
12.....	0.59	0.28	0.46	0.10	0.59	0.28	0.64	0.37
13.....	0.57	0.24	0.47	0.11	0.63	0.35	0.63	0.35
14.....	0.55	0.22	0.46	0.10	0.66	0.42	0.63	0.35
15.....	0.58	0.26	0.46	0.10	0.65	0.39	0.62	0.33
16.....	0.60	0.29	0.46	0.10	0.64	0.37	0.62	0.33
17.....	0.62	0.33	0.45	0.09	0.65	0.39	0.63	0.35
18.....	0.79	0.77	0.46	0.10	0.65	0.39	0.63	0.35
19.....	0.79	0.77	0.47	0.11	0.65	0.39	0.64	0.37
20.....	0.76	0.68	0.48	0.12	0.64	0.37	0.63	0.35
21.....	0.73	0.59	0.47	0.11	0.62	0.33	0.64	0.37
22.....	0.69	0.48	0.47	0.11	0.61	0.31	0.62	0.33
23.....	0.64	0.37	0.46	0.10	0.61	0.31	0.60	0.29
24.....	0.63	0.35	0.46	0.10	0.60	0.29	0.60	0.29
25.....	0.63	0.35	0.45	0.09	0.59	0.28	0.59	0.28
26.....	0.61	0.31	0.45	0.09	0.59	0.28	0.58	0.26
27.....	0.60	0.29	0.45	0.09	0.60	0.29	0.58	0.26
28.....	0.58	0.26	0.44	0.08	0.64	0.37	0.57	0.24
29.....	0.58	0.26	0.44	0.08	0.65	0.39	0.56	0.23
30.....	0.59	0.28	0.44	0.08	0.65	0.39	0.57	0.24
31.....	0.57	0.24	0.44	0.08	.....	.....	0.59	0.28

## MONTHLY DISCHARGE of Snake Creek near Val Marie, for 1915.

(Drainage area 188 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	12.00	3.00	8.10	0.0430	0.016	161
April.....	28.00	0.31	5.60	0.0300	0.034	333
May.....	1.50	0.20	0.40	0.0020	0.002	26
June.....	1.32	0.24	0.54	0.0030	0.003	32
July.....	0.77	0.22	0.37	0.0020	0.002	23
August.....	0.24	0.08	0.13	0.0007	0.001	8
September.....	0.42	0.08	0.27	0.0014	0.002	16
October.....	0.65	0.23	0.37	0.0020	0.002	23
The period.....	.....	.....	.....	.....	0.062	621



## SESSIONAL PAPER No. 25c

## BIGBREED CREEK AT BUZZARD'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 3, Tp. 2, Rge. 11, W. 3rd Mer., about 300 feet from the junction with the Frenchman River. Previous to April 20, 1915, located on SE.  $\frac{1}{4}$  Sec. 15, Tp. 2, Rge. 11, W. 3rd Mer.

*Records available.*—March 23, 1914, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 95.42 feet since April 20, 1915. At old station maintained at 92.13 feet.

*Bench-marks.*—Wooden plug, eight feet northeast of rod. Assumed elevation, 100.00 feet; Supplementary bench-mark on I. P. stake. Elevation, 104.47 feet. Permanent iron bench-mark. Assumed elevation, 100.00 feet used at old station.

*Channel.*—Slightly shifting, and may be affected by high stages on Frenchman River.

*Discharge measurements.*—Made with water or weir.

*Gauge heights.*—No records were available after June 2, 1915.

*Winter flow.*—Station not maintained during winter.

*Observer.*—C. T. McNamara.

## DISCHARGE MEASUREMENTS of Bigbreed Creek at Buzzard's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 23.....	F. R. Steinberger.....	5.0	1.10	0.60	0.97	0.670
Mar. 25.....	do.....	31.0	55.35	1.15	3.37	63.000
Mar. 26.....	do.....	28.4	44.32	1.10	3.07	48.000
Mar. 29.....	do.....	18.3	17.44	1.70	2.23	30.000
Mar. 30.....	do.....	18.0	16.40	1.60	2.12	26.000
Mar. 31.....	do.....	14.0	13.90	1.70	1.91	24.000
April 1.....	do.....	14.0	14.80	1.20	2.05	28.000
April 2.....	do.....	26.0	41.45	1.70	3.42	74.000
April 5.....	do.....	22.0	26.00	1.84	2.62	48.000
April 6.....	do.....	18.0	17.40	1.79	2.12	31.000
April 7.....	do.....	16.0	13.20	1.30	1.83	18.000
April 8.....	do.....	13.5	8.95	0.97	1.63	8.800
April 9.....	do.....	11.5	6.68	1.09	1.49	7.400
April 10.....	do.....	9.0	6.63	0.74	1.63	5.000
April 12.....	do.....	6.3	5.15	0.49	1.32	2.600
April 20.....	do.....				1.01	0.431a
April 28.....	do.....				0.67	0.074a
June 7.....	do.....				1.71	5.700
June 8.....	do.....	4.2	3.92	1.00	1.55	3.900
June 16.....	do.....				0.93	0.459a
July 10.....	do.....				0.00	Nil.
July 21.....	do.....				0.70	0.146a
Aug. 4.....	do.....				Dry.	Nil.
Aug. 13.....	do.....				"	"
Aug. 31.....	do.....				"	"
Sept. 8.....	do.....				"	"
Sept. 21.....	do.....				"	"
Oct. 14.....	do.....				"	"

a Weir measurements.

## DAILY GAUGE HEIGHT AND DISCHARGE of Bigbreed Creek at Buzzard's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.00	27.00	0.70	0.07	1.50	3.40
2.....			3.40	73.00	0.65	0.04	1.50 <sup>d</sup>	3.40
3.....			5.09	130.00	0.60	Nil.	1.53	3.70
4.....			4.49	110.00	0.60	"	1.56	4.00
5.....			2.62	47.00	0.60	"	1.60	4.30
6.....			2.12	31.00	0.65	0.04	1.63	4.60
7.....			1.79	18.00 <sup>k</sup>	0.60	Nil.	1.67 <sup>e</sup>	5.00
8.....			1.69	8.80	0.50	"	1.71	5.40
9.....			1.69 <sup>d</sup>	7.40	Dry.	"	1.62 <sup>d</sup>	4.50
10.....			1.64	5.00 <sup>l</sup>	"	"	1.52	3.60
11.....			1.59	4.20	"	"	1.42	2.80
12.....			1.54 <sup>e</sup>	3.80	"	"	1.32	2.10
13.....			1.49	3.40	"	"	1.22	1.42
14.....			1.39	2.60	0.70	0.07	1.12	0.94
15.....			1.29	1.84	1.00	0.50	1.02 <sup>e</sup>	0.57
16.....			1.39	2.60	1.90	7.30	0.92	0.34 <sup>x</sup>
17.....			1.39	2.60	2.10	9.30		
18.....			1.49	3.40	2.00	8.30		
19.....			1.49	3.40	1.70	5.30		
20.....			1.49	3.40	1.00	0.50		
21.....			1.86 <sup>a</sup>	6.90	0.90	0.30		
22.....			0.96	0.42	0.80	0.15		
23.....	0.97	0.67 <sup>f</sup>	0.96	0.42	0.60	0.00		
24.....	3.42	32.00 <sup>n</sup>	0.76	0.12	Dry.	Nil.		
25.....	3.36	63.00	0.76	0.12	"	"		
26.....	3.11	48.00	0.76	0.12	"	"		
27.....	2.91	42.00 <sup>n</sup>	0.67	0.05	"	"		
28.....	2.21	36.00 <sup>n</sup>	0.67	0.05	"	"		
29.....	2.31	30.00	0.70	0.07	"	"		
30.....	2.10	26.00 <sup>k</sup>	0.70	0.07	"	"		
31.....	1.90	23.80			"	"		

*a* Gauge rod at new station.  
*d* to *e* Gauge heights interpolated.  
*f* to *h* Ice conditions.  
*k* to *l* Shifting conditions.  
*n* Discharge interpolated.  
*x* No observations after June 16.

## MONTHLY DISCHARGE of Bigbreed Creek at Buzzard's Ranch, for 1915.

(Drainage area 83 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31).....	63.00	0.67	33.00	0.398	0.133	589
April.....	130.00	0.05	16.60	0.200	0.223	988
May.....	9.30	0.00	1.03	0.012	0.014	63
June.....	5.40	0.00	1.67	0.020	0.022	99
The period.....					0.400	1,774

## SESSIONAL PAPER No. 25c

## FRENCHMAN RIVER AT BUZZARD'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 3, Tp. 2, Rge. 11, W. 3rd Mer., at Wm. Buzzard's ranch near Corriander Post Office, and below the mouth of Bigbreed Creek.

*Records available.*—March 27, 1914, to October 25, 1915.

*Gauge.*—Vertical staff fastened to post on left bank, about one-half mile upstream from Mr. Buzzard's house. Zero elevation of gauge maintained at 87.50 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark located two feet west of the sill of the north tower of the cable. Assumed elevation, 100.00 feet.

*Channel.*—Probably permanent.

*Discharge measurements.*—Made by wading or from cable.

*Winter flow.*—Station not maintained during winter.

*Observer.*—C. T. MacNamara.

## DISCHARGE MEASUREMENTS of Frenchman River at Buzzard's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 20.....	F. R. Steinberger.....	7 2	3 03	1 28	0 56	3 9
Mar. 22.....	do.....	9 2	4 02	1 52	0 71	6 2
Mar. 23.....	do.....	31 5	31 13	2 03	1 31	84 0
Mar. 24.....	do.....	52 0	146 10	1 40	3 81	204 0
Mar. 25.....	do.....	52 0	147 60	1 34	3 71	198 0
Mar. 26.....	do.....	57 0	270 00	1 50	5 89	406 0
Mar. 29.....	do.....	54 0	207 60	1 65	4 74	341 0
Mar. 30.....	do.....	54 0	204 60	1 78	4 75	364 0
Mar. 31.....	do.....	55 0	233 80	1 90	5 41	442 0
April 1.....	do.....	57 0	247 10	2 03	5 76	502 0
April 3.....	do.....	70 0	355 00	2 59	7 50	920 0
April 5.....	do.....	83 0	508 40	2 20	9 53	1122 0
April 6.....	do.....	74 0	423 00	2 08	8 34	923 0
April 7.....	do.....	81 0	471 40	2 10	9 08	1092 0
April 8.....	do.....	90 0	572 50	2 26	10 24	1287 0
April 9.....	do.....	101 0	646 00	2 24	11 04	1444 0
April 10.....	do.....	107 0	716 60	2 20	11 70	1578 0
April 12.....	do.....	53 0	150 10	3 18	3 59	478 0
April 20.....	do.....	44 0	49 60	3 08	1 38	149 0
April 28.....	do.....	42 0	35 00	2 16	0 95	79 0
April 30.....	do.....	42 0	30 40	1 87	0 83	58 0
June 7.....	do.....	42 0	41 70	2 58	1 04	107 0
June 15.....	do.....	41 0	33 20	2 02	0 88	67 0
July 10.....	do.....	43 0	40 65	1 22	0 76	49 0
July 21.....	do.....	43 0	41 30	2 51	1 00	104 0
Aug. 4.....	do.....	43 0	33 00	1 70	0 79	57 0
Aug. 13.....	do.....	34 0	35 50	0 87	0 69	31 0
Aug. 31.....	do.....	31 0	31 55	0 67	0 60	21 0
Sept. 8.....	do.....	31 0	24 20	0 74	0 55	17 8
Sept. 21.....	do.....	29 0	20 85	1 25	0 65	26 0
Oct. 14.....	do.....	31 0	20 55	1 34	0 66	27 0
Oct. 25.....	do.....	31 0	20 30	1 29	0 65	26 0

## DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman River at Buzzard's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			5.80	502	0.78	50	0.77	49
2.....			5.86	590	0.84	59	0.97	79
3.....			7.55	920	0.88	65	0.87a	64
4.....			9.20	1,000	0.88	65	0.84a	59
5.....			10.33	1,122	0.90	69	0.91a	70
6.....			8.34	923	0.93	73	0.98a	81
7.....			9.25	1,092	0.83	57	1.04	107
8.....			10.15	1,287	0.78	50	1.02a	87
9.....			11.04	1,444	0.78	50	1.00a	84
10.....			11.70	1,578	0.69	37	0.98a	81
11.....			7.24	738	0.73	42	0.96a	78
12.....			3.59	478	0.68	34	0.94a	75
13.....			4.40	601	0.68	34	0.92a	71
14.....			3.20	418	0.83	58	0.90a	69
15.....			3.00	388	0.98	81	0.88	67
16.....			1.80	205	0.78	50	0.78a	50
17.....			1.60	175	0.88	65	0.68a	35
18.....			1.50	160	0.89	67	0.58a	19
19.....			1.50	160	0.78	50	0.49a	9
20.....	0.56	3.9	1.48	149	0.98	80	0.40	3
21.....	0.64	5.0	1.38	141	0.88	65	1.70	190
22.....	0.71	6.2	1.18	111	0.78	50	1.00	84
23.....	1.31	84.0	1.28	126	5.25	730	0.98a	81
24.....	3.80	204.0	1.38	141	4.78	658	0.96a	78
25.....	3.65	198.0	1.18	111	4.28a	582	0.94a	75
26.....	5.92	406.0	1.08	95	3.78a	505	0.92a	71
27.....	5.80	385.0	0.98	81	3.28a	430	0.90a	69
28.....	5.10	365.0	0.95	79	2.78a	354	0.88a	65
29.....	4.89	341.0	0.87a	65	2.28a	278	0.87a	64
30.....	4.68	364.0	0.83	58	1.78a	202	0.86a	63
31.....	5.47	442.0			1.28a	126		

a Interpolated gauge height.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE OF Frenchman River at Buzzard's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.85a	61	0.82a	56	0.59a	21.0	0.65a	26
2.....	0.84a	59	0.81a	55	0.58a	19.8	0.65a	26
3.....	0.83a	57	0.80a	53	0.57a	19.2	0.65a	26
4.....	0.82a	56	0.79	57	0.57a	19.2	0.65a	26
5.....	0.81a	55	0.77a	49	0.56a	18.6	0.65a	26
6.....	0.80a	53	0.75a	46	0.56a	18.6	0.65a	26
7.....	0.79a	52	0.74a	44	0.55a	18.0	0.65a	26
8.....	0.78a	50	0.73a	42	0.55	18.0	0.65a	26
9.....	0.77a	49	0.72a	41	0.56a	18.6	0.65a	26
10.....	0.76	49	0.71a	40	0.56a	18.6	0.65a	26
11.....	0.78a	50	0.69a	36	0.57a	19.2	0.65a	26
12.....	0.80a	53	0.68a	34	0.57a	19.2	0.65a	26
13.....	0.82a	56	0.69	31	0.58a	19.8	0.65a	26
14.....	0.84a	59	0.67a	28	0.58a	19.8	0.66	27
15.....	0.86a	62	0.67a	28	0.59a	21.0	0.66a	27
16.....	0.88a	65	0.67a	28	0.60a	21.0	0.66a	27
17.....	0.90a	69	0.66a	27	0.61a	22.0	0.66a	27
18.....	0.92a	72	0.66a	27	0.62a	23.0	0.66a	27
19.....	0.94a	75	0.65a	26	0.63a	24.0	0.66a	27
20.....	0.97a	79	0.65a	26	0.64a	25.0	0.66a	27
21.....	1.00	104	0.64a	25	0.65	26.0	0.66a	27
22.....	0.98a	81	0.64a	25	0.65a	26.0	0.66a	27
23.....	0.96a	78	0.63a	24	0.65a	26.0	0.66a	27
24.....	0.94a	75	0.63a	24	0.65a	26.0	0.66a	27
25.....	0.92a	72	0.62a	23	0.65a	26.0	0.65	26
26.....	0.90a	69	0.62a	23	0.65a	26.0		
27.....	0.88a	65	0.61a	22	0.65a	26.0		
28.....	0.86a	62	0.61a	22	0.65a	26.0		
29.....	0.85a	61	0.60a	21	0.65a	26.0		
30.....	0.84a	59	0.60a	21	0.65a	26.0		
31.....	0.83a	57	0.60	21				

a Interpolated gauge height.

## MONTHLY DISCHARGE OF Frenchman River at Buzzard's Ranch, for 1915.

(Drainage area 1,778 square miles.)

MONTH.	DISCHARGE IN SECOND FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (20-31).....	442	3.9	234	0.132	0.06	5,568
April.....	1,578	58.0	498	0.280	0.31	29,633
May.....	730	34.0	165	0.093	0.11	10,145
June.....	190	3.0	69	0.039	0.04	4,106
July.....	104	49.0	63	0.035	0.04	3,874
August.....	57	21.0	33	0.019	0.02	2,029
September.....	26	18.0	22	0.012	0.01	1,309
October (1-25).....	27	26.0	26	0.015	0.01	1,290
The period.....					0.60	57,954

## LITTLEBREED CREEK NEAR BUZZARD'S RANCH.

Location.—On the NW. 1 Sec. 11, Tp. 2, Rge. 11, W. 3rd Mer., near Corriander Post Office. Records available.—March 28, 1914, to October 31, 1915.

Gauge.—Vertical staff. Zero elevation has been maintained at 92.82 feet since establishment.

Bench-mark.—Permanent iron bench-mark located on the left bank about 60 feet from the gauge. Assumed elevation, 100.00 feet.

*Channel*.—Probably permanent.

*Discharge measurements*.—Made by meter and by weir at low stages.

*Winter flow*.—This station is not maintained during the winter.

*Observer*.—C. T. MacNamara.

DISCHARGE MEASUREMENTS of Littlebreed Creek near Buzzard's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 29.....	F. R. Steinberger.....	18	22.0	0.58	2.50	12.80
Mar. 30.....	do.....	28	54.0	0.32	3.10	17.40
Mar. 31.....	do.....	19	27.0	0.56	2.62	15.20
April 1.....	do.....	19	26.0	0.54	2.50	13.80
April 6.....	do.....	22	39.0	0.58 <sup>a</sup>	3.13	22.00
April 7.....	do.....	16	21.0	0.59	2.25	12.30
April 8.....	do.....	14	10.0	0.68	1.62	6.70
April 9.....	do.....	11	4.2	0.97	1.22	4.00
April 10.....	do.....	7	2.5	0.76	1.04	1.91
April 12.....	do.....				0.82	0.79 <sup>a</sup>
April 20.....	do.....				0.42	Nil.
April 28.....	do.....				Dry.	"
June 7.....	do.....	5	3.4	0.68	1.04	2.30
June 16.....	do.....				0.50	0.18 <sup>a</sup>
July 10.....	do.....				Dry.	Nil.
July 21.....	do.....				0.55	0.36 <sup>a</sup>
Aug. 4.....	do.....				Dry.	Nil.
Aug. 13.....	do.....				"	"
Aug. 31.....	do.....				"	"
Sept. 8.....	do.....				"	"
Sept. 21.....	do.....				"	"
Oct. 14.....	do.....				"	"

<sup>a</sup> Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Littlebreed Creek near Buzzard's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.85	17.80	Dry.	Nil.	1.15	3.60
2.....			3.55	31.00	"	"	2.15	10.60
3.....			5.35	125.00	"	"	Dry.	Nil.
4.....			4.85	95.00	"	"	"	"
5.....			3.90	42.00	"	"	"	"
6.....			3.15	22.00	"	"	"	"
7.....			2.05	9.80	"	"	"	"
8.....			1.55	6.20	"	"	"	"
9.....			1.22	4.00	"	"	"	"
10.....			1.04	2.90	"	"	"	"
11.....			0.93 <sup>a</sup>	2.30	"	"	"	"
12.....			0.82	1.76	"	"	"	"
13.....			1.25	4.20	"	"	"	"
14.....			1.15	3.60	"	"	"	"
15.....			1.05	3.00	2.45	13.30	"	"
16.....			0.45	0.09	2.55	14.30	"	"
17.....			0.35	Nil.	2.75	16.60	"	"
18.....			Dry.	"	1.35	4.80	"	"
19.....			"	"	1.05	3.00	"	"
20.....			"	"	1.00	2.70	"	"
21.....			"	"	0.95	2.40	"	"
22.....			"	"	0.85	1.93	"	"
23.....			"	"	0.75	1.38	"	"
24.....			"	"	0.66	0.90	"	"
25.....			"	"	Dry.	Nil.	"	"
26.....			"	"	"	"	"	"
27.....			"	"	"	"	"	"
28.....	3.15	22.0	"	"	"	"	"	"
29.....	2.75	16.6	"	"	"	"	"	"
30.....	3.10	21.0	"	"	"	"	"	"
31.....	2.95	19.1	"	"	"	"	"	"

<sup>a</sup> Interpolated.  
Dry July 1 to Oct. 31.

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Littlebreed Creek near Buzzard's Ranch, for 1915.

(Drainage area 61 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (28-31).....	22.0	16.60	20.00	0.328	0.65	159
April.....	125.0	0.09	12.30	0.201	0.22	732
May.....	16.6	0.90	2.00	0.033	0.04	123
June.....	10.6	3.60	0.47	0.008	0.01	28
July.....						Nil.
August.....						"
September.....						"
October.....						"
The period.....					0.32	1,042

## FRENCHMAN RIVER AT MARTIN'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 24, Tp. 1, Rge. 11, W. 3rd Mer., about five miles below station at Buzzard's ranch.

*Records available.*—Two discharge measurements only in 1915.

*Gauge.*—Vertical staff on right bank just above trail crossing.

*Bench-marks.*—Temporary. No. 1: Top of wooden plug, 40 feet east of rod at fence. Elevation 8.58 feet above zero of gauge. No. 2: On left corner of west window sill of S. A. Martin's house. Elevation 17.46 feet above zero of gauge.

*Discharge measurements.*—Made by wading at crossing below gauge or from cable at Buzzard's ranch.

*Remarks.*—This station was established to take the place of that at Buzzard's ranch on September 22, 1915, as an observer could not be obtained at that point.

## DISCHARGE MEASUREMENTS of Frenchman River at Martin's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 22.....	G. H. Whyte and F. R. Steinberger.	47	29	0.91	1.00	26
Oct. 15.....	F. R. Steinberger	47	28	0.92	1.00	26

## MCEACHRAN CREEK AT MCCOY'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 6 Tp. 1, Rge. 7, W. 3rd Mer., about fifty feet north of Mr. McCoy's house.

*Records available.*—May 1, 1914, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation has been maintained at 89.5 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Probably permanent.

*Discharge measurements.*—Made with meter and by weir at low stages.

*Winter flow.*—Station not maintained during the winter.

*Diversion.*—There is no diversion from this stream.

*Observer.*—Donald McCoy.



## DISCHARGE MEASUREMENTS of McEachran Creek at McCoy's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 23.....	F. R. Steinberger.....				0.50	0.35a
June 11.....	do.....	3.5	1.92	1.28	0.92	2.40
July 14.....	do.....				0.41	0.11a
July 17.....	do.....				0.45	0.28a
Sept. 4.....	do.....				Dry.	Nil.
Oct. 19.....	do.....					

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of McEachran Creek at McCoy's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.85	8.60	0.34	0.08	1.18	4.10
2.....			2.05	10.00	0.34	0.08	1.18	4.10
3.....			2.60	13.60	0.34	0.08	1.18	4.10
4.....			2.85	15.30	0.34	0.08	1.18	4.10
5.....			2.40	12.30	0.32	0.06	1.18	4.10
6.....			1.75	8.00	0.29	0.04	1.23	4.50
7.....			1.55	6.60	0.29	0.04	1.21	4.30
8.....			1.30	4.90	0.24	0.03	1.13	3.80
9.....			1.25	4.60	0.14	0.01	1.03	3.10
10.....			1.25	4.60	0.14	0.01	0.85	1.94
11.....			1.10	3.60	Dry.	Nil.	0.78	1.51
12.....			1.00	2.90	"	"	0.75	1.35
13.....			0.95	2.60	"	"	0.70	1.08
14.....			0.85	1.94	0.44	0.22	0.70	1.08
15.....			0.80	1.62	0.52	0.41	0.65	0.99
16.....			0.75	1.35	0.56	0.53	0.62	0.74
17.....			0.70	1.08	0.49	0.33	0.60	0.65
18.....			0.65	0.86	0.44	0.22	0.60	0.65
19.....			0.65	0.86	0.44	0.22	0.60	0.65
20.....			0.60	0.65	0.39	0.13	0.60	0.65
21.....			0.55	0.50	0.39	0.13	0.55	0.59
22.....			0.55	0.50	0.39	0.13	0.55	0.50
23.....			0.53	0.44	0.39	0.13	0.55	0.50
24.....	1.40	5.6	0.50	0.35	0.39	0.13	0.55	0.50
25.....	2.50	13.0	0.50	0.35	0.44	0.22	0.52	0.41
26.....	2.50	13.0	0.50	0.35	4.57	27.00	0.60	0.65
27.....	2.40	12.3	0.45	0.24	3.34	18.60	0.55	0.50
28.....	2.15	10.6	0.45	0.24	1.84	8.60	0.68	0.99
29.....	2.05	10.0	0.40	0.14	1.49	6.20	1.10	3.60
30.....	2.05	10.0	0.37	0.11	1.39	5.50	1.10	3.60
31.....	1.95	9.3			1.26	4.70		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of McEachran Creek at McCoy's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.78	1.51	0.20	0.02
2.....	0.70	1.08	0.18	0.02
3.....	0.65	0.86	0.18	0.02
4.....	0.62	0.74	0.18	0.02
5.....	0.60	0.65	0.18	0.02
6.....	0.58	0.59	0.18	0.02
7.....	0.52	0.41	0.18	0.02
8.....	0.50	0.35	0.17	0.02
9.....	0.50	0.35	0.17	0.02
10.....	0.50	0.35	0.17	0.02
11.....	0.48	0.31	0.17	0.02
12.....	0.40	0.14	0.17	0.02
13.....	0.34	0.07	0.17	0.02
14.....	0.42	0.12	0.17	0.02
15.....	0.37	0.11	0.17	0.02
16.....	0.46	0.27	0.17	0.02
17.....	0.46	0.27	0.17	0.02
18.....	0.45	0.24	0.17	0.02
19.....	0.44	0.22	0.17	0.02
20.....	0.40	0.14	0.17	0.02
21.....	0.36	0.10	0.16	0.02
22.....	0.35	0.09	0.16	0.02
23.....	0.34	0.08	0.16	0.02
24.....	0.32	0.06	0.16	0.02
25.....	0.30	0.04	0.15	0.02
26.....	0.30	0.04	0.14	0.01
27.....	0.28	0.04	0.13	0.01
28.....	0.25	0.03	0.12	0.01
29.....	0.25	0.03	0.10	0.01
30.....	0.25	0.03	0.06	Nil.
31.....	0.22	0.02	0.04	"

a Dry until Oct. 31.

## MONTHLY DISCHARGE of McEachran Creek at McCoy's Ranch, for 1915.

(Drainage area 107 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31).....	13.00	5.60	10.50	0.098	0.039	147
April.....	15.30	0.11	3.60	0.034	0.038	214
May.....	27.00	Nil.	2.40	0.022	0.025	147
June.....	4.50	0.41	1.90	0.018	0.002	113
July.....	1.51	0.02	0.30	0.003	0.001	18
August.....	0.02	Nil.	0.02	0.001	0.001	1
September.....						Nil.
October.....						"
The period.....					0.098	663

## HORSE CREEK NEAR BARNARD, MONTANA, U.S.A.

*Location.*—About one mile north of Barnard post office on United States unsurveyed land and about one-quarter mile south of the international boundary.

*Records available.*—May 1, 1914, to October 31, 1915.

*Gauge.*—Staff gauge, fastened to a post on the right bank. The elevation of the zero of the gauge has been maintained at 92.54 feet since establishment.

*Bench-mark.*—Wooden plug driven in the left bank 30 feet from the gauge. Assumed elevation, 100.00 feet.

*Channel.*—Probably permanent.

*Discharge measurements.*—Made by wading with meter and by weir at low stages.

*Winter flow.*—This station is not maintained during the winter.

*Observer.*—W. J. Harris.

## DISCHARGE MEASUREMENTS of Horse Creek near Barnard, Mont., U.S.A., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 24.....	F. R. Steinberger.....	<i>a</i>	.....	.....	0.44	0 336
June 12.....	do.....	<i>a</i>	.....	.....	0.44	0.351
July 15.....	do.....	<i>a</i>	.....	.....	0.30	Nil.
Aug. 9.....	do.....	.....	.....	.....	0.00	"
Sept. 4.....	do.....	.....	.....	.....	0.00	"
Oct. 19.....	do.....	<i>a</i>	.....	.....	0.24	"

*a* Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Horse Creek near Barnard, Mont., U.S.A., for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	.....	1.20	14.00	Dry.	Nil.	0.44	0.64
2.....	.....	.....	2.50	87.00	"	"	0.44	0.64
3.....	.....	.....	3.10	135.00	"	"	0.44	0.64
4.....	.....	.....	4.00	207.00	"	"	0.43	0.58
5.....	.....	.....	3.50	167.00	"	"	0.52	1.20
6.....	.....	.....	3.10	135.00	"	"	0.53	1.30
7.....	.....	.....	3.00	127.00	"	"	0.51	1.10
8.....	.....	.....	2.70	103.00	"	"	0.49	0.94
9.....	.....	.....	2.50	87.00	"	"	0.49	0.94
10.....	.....	.....	2.50	87.00	"	"	0.48	0.88
11.....	.....	.....	2.00	51.00	"	"	0.46	0.76
12.....	.....	.....	1.50	24.00	"	"	0.44	0.64
13.....	.....	.....	1.18	13.40	"	"	0.44	0.64
14.....	.....	.....	0.93	7.00	0.50	1.00	0.44	0.64
15.....	.....	.....	0.83	5.00	0.60	2.00	0.44	0.64
16.....	.....	.....	0.68	2.80	0.45	0.70	0.44	0.64
17.....	.....	.....	0.58	1.80	0.45	0.70	0.44	0.64
18.....	.....	.....	0.58	1.80	0.44	0.64	0.44	0.64
19.....	.....	.....	0.63	2.30	0.44	0.64	0.44	0.64
20.....	.....	.....	0.58	1.80	0.42	0.52	0.44	0.64
21.....	.....	.....	0.54	1.40	0.42	0.52	0.44	0.64
22.....	.....	.....	0.52	1.20	0.42	0.52	0.45	0.70
23.....	.....	.....	0.48	0.88	0.42	0.52	0.45	0.70
24.....	.....	.....	0.44	0.64	0.42	0.52	0.45	0.70
25.....	.....	.....	0.40	0.40	1.00	8.40	0.45	0.70
26.....	.....	.....	0.35	0.20	2.30	71.00	0.45	0.70
27.....	.....	.....	0.34	0.16	2.00	51.00	0.46	0.76
28.....	0.50	1.00	0.33	0.12	1.50	24.00	0.46	0.76
29.....	0.50	1.00	0.36	0.24	1.00	8.40	0.46	0.76
30.....	1.00	8.40	0.33	0.12	1.75	36.00	0.46	0.76
31.....	1.00	8.40	.....	.....	0.50	1.00	.....	.....

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DAILY GAUGE HEIGHT AND DISCHARGE of Horse Creek near Barnard, Mont., U.S.A., for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.47	0.82	Dry.	Nil.	Dry.	Nil.	0.25	Nil.
2.....	0.46	0.76	"	"	"	"	0.26	"
3.....	0.44	0.64	"	"	"	"	0.26	"
4.....	0.44	0.40	"	"	"	"	0.28	"
5.....	0.39	0.36	"	"	"	"	0.29	"
6.....	0.36	0.24	"	"	"	"	0.30	"
7.....	0.35	0.20	"	"	"	"	0.30	"
8.....	0.35	0.20	"	"	"	"	0.30	"
9.....	0.35	0.20	"	"	"	"	0.32	0.08
10.....	0.35	0.20	"	"	"	"	0.32	0.08
11.....	0.34	0.16	"	"	"	"	0.34	0.16
12.....	0.34	0.16	"	"	0.25	"	0.34	0.16
13.....	0.33	0.12	"	"	0.25	"	0.35	0.20
14.....	0.33	0.12	"	"	0.30	"	0.35	0.20
15.....	0.33	0.12	"	"	0.31	0.04	0.35	0.20
16.....	0.33	0.12	0.25	"	0.30	Nil.	0.35	0.20
17.....	Dry.	Nil.	0.30	"	0.30	"	0.35	0.20
18.....	"	"	0.25	"	0.30	"	0.35	0.20
19.....	"	"	Dry.	"	0.32	0.08	0.35	0.20
20.....	"	"	"	"	0.35	0.20	0.34	0.16
21.....	"	"	"	"	0.37	0.28	0.33	0.12
22.....	0.35	0.20	"	"	0.40	0.40	0.32	0.08
23.....	0.35	0.20	"	"	0.45	0.70	0.30	Nil.
24.....	0.34	0.16	"	"	0.40	0.40	0.30	"
25.....	0.30	0.00	"	"	0.40	0.40	0.30	"
26.....	0.30	0.00	"	"	0.35	0.20	0.28	"
27.....	Dry.	Nil.	"	"	0.30	Nil.	0.28	"
28.....	"	"	"	"	0.30	"	0.27	"
29.....	"	"	"	"	0.25	"	0.27	"
30.....	"	"	"	"	0.25	"	0.25	"
31.....	"	"	"	"	"	"	0.25	"

## MONTHLY DISCHARGE of Horse Creek near Barnard, Mont., U.S.A. for 1915.

(Drainage area 71 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (28-31).....	8.40	1.00	4.70	0.0660	0.070	34
April.....	207.00	0.12	42.00	0.5920	0.660	2,499
May.....	71.00	0.00	6.70	0.0940	0.180	412
June.....	1.30	0.58	0.75	0.0110	0.011	45
July.....	0.82	Nil.	0.17	0.0024	0.003	12
August.....	Nil.	"	Nil.	Nil.	Nil.	Nil.
September.....	0.70	"	0.09	0.0013	0.001	5
October.....	0.20	"	0.07	0.0010	0.001	4
The period.....					0.854	1,911

## BOWREY DITCH FROM ROCK CREEK, MONTANA, U.S.A.

*Location.*—In United States unsurveyed territory near Barnard, Montana.

*Records available.*—June 1, August 26, 1914. No records obtainable in 1915.

*Gauge.*—Vertical staff. Elevation of zero, 96.51 feet.

*Bench-mark.*—Stake on left bank. Assumed elevation, 100.00 feet.

*Discharge measurements.*—By wading.

*Observer.*—C. W. Bowrey.

## ROCK CREEK NEAR BARNARD, MONTANA, U.S.A.

*Location.*—On United States unsurveyed land, about one-half mile south of the international boundary.

*Records available.*—May 1, 1914, to October 31, 1915.

*Gauge.*—Vertical staff on the right bank of the creek 120 feet below Mr. Bowrey's dam. The elevation of the zero of the gauge was maintained at 91.83 feet up to October 19, 1915, at the old station one-quarter mile downstream. New station was established on October 19, 1915, with an elevation of zero at 91.91 feet.

*Bench-mark.*—Wooden plug 20 feet from rod. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made by wading.

*Winter flow.*—Station not maintained during the winter.

*Observer.*—Chas. Bowrey.

## DISCHARGE MEASUREMENTS of Rock Creek near Barnard, Montana, U.S.A., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 24.....	F. R. Steinberger.....	11.0	4.60	2.08	.....	9.6
June 12.....	do.....	14.3	5.86	1.00	0.83	5.9
July 15.....	do.....	15.0	3.90	0.67	0.66	2.6
Aug. 9.....	do.....	8.5	4.08	0.63	0.64	2.6
Sept. 4.....	do.....	.....	.....	.....	0.25	..... <sup>a</sup>
Oct. 19.....	do.....	9.7	2.87	0.46	1.65	1.3

<sup>a</sup> Small trickle, too small to measure.

## DAILY GAUGE HEIGHT AND DISCHARGE of Rock Creek near Barnard, Montana, U.S.A., for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	.....	2.86	30.06	0.95 <sup>a</sup>	8.3	1.26	14.9
2.....	.....	.....	2.86	32.06	0.91	7.5	1.11	11.7
3.....	.....	.....	3.46 <sup>a</sup>	35.06	0.91	7.5	.....	11.06
4.....	.....	.....	4.90 <sup>a</sup>	44.06	0.91 <sup>a</sup>	7.5	.....	10.66
5.....	.....	.....	4.14 <sup>a</sup>	52.06	0.91	7.5	.....	10.26
6.....	.....	.....	3.36	61.0	0.91 <sup>a</sup>	7.5	.....	9.86
7.....	.....	.....	2.36	39.0	0.91 <sup>a</sup>	7.5	.....	9.46
8.....	.....	.....	2.11	34.0	0.90	7.3	.....	8.26
9.....	.....	.....	2.11	34.0	.....	6.56	.....	7.56
10.....	.....	.....	2.11	34.0	.....	6.26	.....	6.86
11.....	.....	.....	1.36	17.1	.....	5.06	.....	6.26
12.....	.....	.....	1.26	14.9	.....	3.26	0.83	5.8
13.....	.....	.....	1.21	13.8	.....	2.46	.....	5.76
14.....	.....	.....	1.14 <sup>a</sup>	12.3	.....	2.26	.....	5.56
15.....	.....	.....	1.06	10.6	.....	5.46	.....	5.46
16.....	.....	.....	1.06	10.6	.....	10.26	.....	4.86
17.....	.....	.....	1.06	10.6	.....	9.46	.....	4.66
18.....	.....	.....	1.02	9.8	.....	9.46	.....	4.86
19.....	.....	.....	1.00	9.4	.....	8.66	.....	5.26
20.....	.....	.....	0.96	8.5	.....	8.26	.....	4.86
21.....	.....	.....	1.00	9.4	.....	7.66	.....	4.66
22.....	.....	.....	1.06	10.6	.....	7.46	.....	4.46
23.....	.....	.....	1.03	10.0	.....	6.66	.....	3.66
24.....	.....	.....	1.03	10.0	.....	6.06	.....	3.06
25.....	5.48	246	1.02	9.8	.....	5.46	.....	2.86
26.....	5.16	406	.....	.....	.....	.....	.....	.....
27.....	4.36	256	1.01	9.6	.....	70.06	.....	5.66
28.....	4.06	306	1.01	9.6	3.36	61.0	.....	8.46
29.....	3.56	286	1.11	11.7	2.16	35.0	.....	10.66
30.....	3.32	346	1.02 <sup>a</sup>	9.8	1.86	28.0	.....	10.46
31.....	3.13	306	1.00 <sup>a</sup>	9.4	1.60	22.0	.....	11.66
.....	2.94 <sup>a</sup>	286	.....	.....	1.34	16.7	.....	.....

<sup>a</sup> Interpolated.

<sup>b</sup> Estimated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Rock Creek near Barnard, Montana, U.S.A., for 1915.  
—Concluded.

DAY	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		10.4c	0.75a	4.30	0.35a	0.25	0.65	0.01
2.....		8.6c	0.75	4.30	0.33a	0.19	0.69a	0.02
3.....		8.2c	0.75a	4.30	0.29a	0.09	0.80a	0.05
4.....		7.6c	0.74	4.10	0.25a	0.05	1.50	5.20
5.....		7.6c	0.72a	3.70	0.25a	0.07b	1.25a	1.20
6.....		6.8c	0.70	3.30	0.24a	0.07	1.00	0.08
7.....		6.2c	0.72a	3.70	0.25a	0.08	1.00a	0.06
8.....		6.0c	0.74	4.10	0.28a	0.08	1.00	0.04
9.....		5.6c	0.64	2.50	0.31a	0.10	0.95a	0.05
10.....		5.4c	0.65a	2.60	0.30a	0.10	0.90	0.01
11.....	0.80	5.2	0.67a	2.90	0.32a	0.11	1.00a	0.02
12.....	0.80	5.2	0.68	3.00	0.34a	0.12	1.08a	0.06
13.....	0.78	4.9	0.65	2.60	0.38a	0.13	1.16a	0.08
14.....	0.75	4.3	0.65	2.60	0.75	1.30	1.25a	0.14
15.....	0.68	3.0	0.65a	2.60	0.72a	0.95	1.33a	0.20
16.....	0.74a	4.1	0.65	2.60	0.70	0.68	1.42a	0.40
17.....	0.79a	5.0	0.65a	2.60	0.69a	0.54	1.45a	0.60
18.....	0.85	6.2	0.64	2.50	0.68	0.57	1.57a	0.90
19.....	0.92	7.7	0.62a	2.20	0.67a	0.42	1.65	1.33b
20.....	1.00	9.4	0.60a	1.90	0.67a	0.35	.....	1.02c
21.....	0.97a	8.8	0.56a	1.54	0.65	0.22	.....	0.72c
22.....	0.93	7.9	0.54a	1.36	0.65a	0.15	.....	0.40c
23.....	0.91a	7.5	0.52a	1.18	0.65a	0.11	.....	0.28c
24.....	0.89a	7.1	0.50a	1.00	0.65	0.08	.....	0.22c
25.....	0.87	6.7	0.48a	0.88	0.67a	0.07	.....	0.24c
26.....	0.86a	6.5	0.46a	0.76	0.68	0.07	.....	0.42c
27.....	0.85	6.2	0.45a	0.70	0.67a	0.05	.....	0.36c
28.....	0.82a	5.6	0.44a	0.64	0.66a	0.04	.....	0.25c
29.....	0.80	5.2	0.42a	0.52	0.65	0.03	.....	0.18c
30.....	0.78a	4.8	0.40a	0.40	0.65a	0.02	.....	0.22c
31.....	0.75	4.3	0.38a	0.34	.....	.....	.....	0.16c

a Interpolated.

b to c Shifting conditions.

c Estimated.

## MONTHLY DISCHARGE of Rock Creek near Barnard, Montana, U.S.A., for 1915.

(Drainage area 230 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
March (24-31).....	40.00	24.00	30.00	0.130	0.04	476
April.....	61.00	8.50	20.00	0.087	0.10	1,180
May.....	70.00	2.20	13.00	0.057	0.07	799
June.....	14.90	2.80	7.30	0.032	0.04	484
July.....	10.40	3.00	6.40	0.028	0.03	394
August.....	4.30	0.34	2.50	0.010	0.01	141
September.....	1.30	0.02	0.24	0.001	0.01	15
October.....	5.20	0.01	0.48	0.002	0.01	31
The period.....					0.31	3,179

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Frenchman River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Fect.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Mar. 30.	M. H. French.	Belanger Creek.	SW. 30-6-25-3.	9.0	6.50	3.58	24,000
April 12.	do	do	do	14.0	6.60	2.06	13,600
July 15.	J. E. Caughey	Blacktail Creek.	NW. 20-6-23-3.	<i>a</i>			0.282
Aug. 5.	do	do	do	<i>a</i>			0.282
Aug. 25.	do	do	do	<i>a</i>			0.239
Sept. 25.	do	do	do	<i>a</i>			0.428
Oct. 14.	do	do	do	<i>a</i>			0.332
Oct. 28.	do	do	do	<i>a</i>			0.302
April 22.	F. R. Steinberger.	Bluff Creek.	SE. 10-2-9-3.	<i>a</i>			0.058
July 12.	J. E. Caughey	Calif Creek.	SE. 5-5-22-3.	4.5	1.25	1.05	1,310
Aug. 4.	do	do	do	4.5	1.10	1.55	1,700
Aug. 24.	do	do	do	<i>a</i>			1,050
Sept. 24.	do	do	do	<i>a</i>			0,940
Oct. 13.	do	do	do	<i>a</i>			0,920
July 13.	do	Concrete Coulee.	NW. 2-7-23-3.	<i>a</i>			0.998
Aug. 4.	do	do	do	<i>a</i>			0.494
Aug. 25.	do	do	do	<i>a</i>			0.836
Sept. 25.	do	do	do	<i>a</i>			1,090
Oct. 14.	do	do	do	<i>a</i>			1,134
Oct. 28.	do	do	do	<i>a</i>			1,178
July 13.	do	Doyle Coulee.	SW. 17-7-22-3.	<i>a</i>			0.520
Aug. 4.	do	do	do	<i>a</i>			0.420
Aug. 25.	do	do	do	<i>a</i>			0.217
Sept. 25.	do	do	do	<i>a</i>			0.302
Oct. 14.	do	do	do	<i>a</i>			0.302
Oct. 28.	do	do	do	<i>a</i>			0.332
April 12.	M. H. French.	Frenchman River.	SE. 19-6-25-3.				3,000
July 16.	J. E. Caughey	do	do	7.0	2.90	0.79	0,300
Aug. 6.	do	do	do	5.0	1.25	0.32	0,399
Aug. 27.	do	do	do	<i>a</i>			0.039
Sept. 28.	do	do	do	<i>a</i>			0.302
Oct. 18.	do	do	do	<i>a</i>			0.028
Oct. 29.	do	do	do	<i>a</i>			0.015
Mar. 18.	M. H. French.	do	SE. 32-6-21-3.	21.0	17.80	1.09	19,200
Mar. 19.	do	do	do	21.0	16.95	1.05	17,200
Mar. 20.	do	do	do	21.0	18.65	1.06	19,800
Mar. 21.	do	do	do	23.0	21.15	1.23	26,000
Mar. 24.	do	do	do	42.0	32.60	4.15	134,000
Mar. 29.	do	do	do	41.0	25.65	2.13	55,000
April 19.	do	do	NW. 25-6-22-3.	23.0	24.10	1.63	40,000
April 19.	do	do	do	34.0	38.50	2.22	86,000
May 24.	F. R. Steinberger.	do	do	53.6	25.58	2.70	70,000
June 3.	do	do	Sec. 14-4-14-3.	32.0	33.40	1.50	53,000
June 22.	do	do	do	35.0	35.50	1.84	65,000
Aug. 18.	do	do	do	26.0	20.80	2.03	43,000
Aug. 27.	do	do	do	27.0	17.10	1.42	24,000
Sept. 11.	do	do	do	27.0	18.30	1.35	25,000
July 31.	do	do	do	29.5	21.66	1.62	35,000
Mar. 27.	M. H. French.	N. Br. Frenchman River.	do	32.5	37.27	1.40	53,000
May 1.	F. R. Steinberger.	Fireguard Creek.	NE. 16-7-22-3.	8.0	5.11	2.25	11,600
June 9.	do	Littlereed Creek.	SW. 9-3-11-3.	<i>a</i>			<i>b</i> 0.140
June 15.	do	do	Sec. 2-3-10-3.	<i>a</i>			0.100
July 12.	do	do	do	<i>a</i>			0.101
July 19.	do	do	do	<i>a</i>			1.060
July 2.	do	do	do	<i>a</i>			0.726
Aug. 5.	do	do	do	<i>a</i>			0.051
Aug. 12.	do	do	do	<i>a</i>			<i>b</i>
June 12.	do	E. Br. McEachran Creek.	SE. 6-1-7-3.	<i>a</i>			<i>b</i>
April 22.	do	Molestead Coulee.	Sec. 12-2-10-3.	<i>a</i>			Nil.
July 30.	do	Mule Creek.	SE. 27-5-17-3.	<i>a</i>			0.762
Aug. 21.	do	do	do	<i>a</i>			0.327
June 10.	do	Ogne Coulee.	Sec. 28-1-8-3.	<i>a</i>			0.246
July 19.	do	do	do	<i>a</i>			0.169
Aug. 6.	do	do	do	<i>a</i>			0.126
Aug. 11.	do	do	do	<i>a</i>			<i>b</i>
April 22.	do	Otter Coulee.	SW. 1-2-10-3.	<i>a</i>			Nil.
July 13.	J. E. Caughey	Petrified Coulee.	SE. 18-7-22-3.	<i>a</i>			0.349
Aug. 4.	do	do	do	<i>a</i>			0.302
Aug. 25.	do	do	do	<i>a</i>			0.161
Sept. 25.	do	do	do	<i>a</i>			0.219
Oct. 14.	do	do	do	<i>a</i>			0.180
Oct. 28.	do	do	do	<i>a</i>			0.260
May 1.	F. R. Steinberger	Police Creek.	NW. 12-4-12-3.	<i>a</i>			Nil.
June 5.	do	do	do	<i>a</i>			0.120
June 18.	do	do	do	<i>a</i>			0.224
July 9.	do	do	do	<i>a</i>			0.193
Aug. 3.	do	do	do	<i>a</i>			Nil.
Aug. 6.	do	do	do	<i>a</i>			<i>b</i>
June 2.	do	Shotgun Coulee.	NE. 21-4-14-3.	<i>a</i>			2.040
July 25.	do	do	Sec. 14-4-11-3.	<i>a</i>			0.236

*a* Weir measurement.*b* Flow very small.*c* Estimated flow.



## SWIFTCURRENT CREEK DRAINAGE BASIN

*General Description.*

Swiftcurrent Creek rises in the eastern slope of the Cypress Hills, follows a northeasterly course for seventy-five miles and then a northerly one for about twenty-five miles and finally empties into the South Saskatchewan River in Township 20, Range 13, West of 3rd Meridian.

The only important tributary is Bone Creek, which rises in the Cypress Hills and joins the Swiftcurrent in Township 10, Range 19, West of 3rd Meridian.

The main stream flows through a valley, two to three hundred feet deep and a mile wide, to within a few miles of its mouth, where it enters a sandstone gorge, about five hundred feet deep.

The bench land above the creek is of rolling prairie broken by innumerable coulees. The soil is a sandy loam. There is very little tree growth along the stream.

The mean annual rainfall at the town of Swift Current is about fifteen inches. This increases slightly at the stream's headwaters. The greatest precipitation occurs during the months of May, June and July. From November to April the stream is frozen over.

There are a number of small irrigation ditches in this drainage basin, and the town of Swift Current and the Canadian Pacific Railway Company take water for domestic and industrial purposes from the creek.

## D. H. POLLOCK EAST DITCH FROM SWIFTCURRENT CREEK.

*Location.*—On NW.  $\frac{1}{4}$  Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer., about one-quarter mile from point of intake.

*Records available.*—Irrigation seasons 1913-15 and a few discharge measurements from 1909-12.

*Gauge.*—Vertical staff. Zero maintained at elevation of 98.92 feet during 1915.

*Bench-mark.*—Wooden plug. Assumed elevation of 100.00 feet.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—D. H. Pollock.

## DISCHARGE MEASUREMENTS of D. H. Pollock East Ditch from Swiftcurrent Creek, in 1915.

Date.		Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
May	18.	J. E. Caughey					Nil.
June	11.	do	3.0	1.07	0.87	0.58	0.91
July	7.	do	3.0	0.90	0.74	0.58	0.66
July	29.	do					N.I.

## DAILY GAUGE HEIGHT AND DISCHARGE of D. H. Pollock East Ditch from Swiftcurrent Creek, for 1915.

DAY.	June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
1.....			0.54	0.59
2.....			0.54	0.59
3.....	0.67 <sup>a</sup>	1.62	0.54	0.59
4.....	0.67	1.62	0.54	0.59
5.....	0.67	1.62	0.54	0.59
6.....	0.50	0.35	0.54	0.59
7.....	0.50	0.35	0.54	0.59
8.....	0.50	0.35	0.54	0.59
9.....	0.50	0.35	0.54	0.59
10.....	0.50	0.35	0.54	0.59
11.....	0.58	0.83	0.54	0.59
12.....	0.50	0.35	0.54	0.59
13.....	0.50	0.35	0.54	0.59
14.....	0.50	0.35	0.54	0.59
15.....	0.50	0.35	0.54	0.59
16.....	0.50	0.35	0.54 <sup>b</sup>	0.59
17.....	0.50	0.35		
18.....	0.50	0.35		
19.....	0.85	3.40		
20.....	0.83	3.20		
21.....	0.75	2.40		
22.....	0.62	1.14		
23.....	0.58	0.83		
24.....	0.56	0.71		
25.....	0.54	0.59		
26.....	0.67	1.62		
27.....	0.54	0.59		
28.....	0.54	0.59		
29.....	0.54	0.59		
30.....	0.62	1.14		
31.....				

<sup>a</sup> Headgates opened.<sup>b</sup> Headgates closed.

## MONTHLY DISCHARGE of D. H. Pollock East Ditch from Swiftcurrent Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
June (3-30).....	3.40	0.35	0.95	53
July (1-16).....	0.59	0.59	0.59	19
				72

## D. H. POLLOCK WEST DITCH FROM SWIFTCURRENT CREEK.

*Location.*—On NW.  $\frac{1}{4}$  Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer.*Records available.*—Discharge measurements taken in the irrigation season of 1913. Gauge heights during the irrigation season of 1914. J. E. Caughey visited this station on May 18, 1915, and reported no flow.*Gauge.*—Vertical staff, on the north side of the west end of the flume. Zero elevation 3072.92 feet referred to Canadian Pacific Railway datum.*Bench-mark.*—Permanent iron bench-mark, situated near the flume. Elevation 3074.89 feet Canadian Pacific Railway datum.*Channel.*—Flume.*Discharge measurements.*—Made with meter or weir.*Observer.*—D. H. Pollock.

## SESSIONAL PAPER No. 25c

## SWIFTCURRENT CREEK AT POLLOCK'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 22, Tp. 7, Rge. 21, W. of the 3rd Meridian.

*Records available.*—May 18, 1909, to October 31, 1915. Two discharge measurements in 1908.

*Gauge.*—Vertical staff. Elevation of zero 1909-12 maintained at 89.25 feet; 1913-15 maintained at 88.75 feet.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Sand and gravel.

*Discharge measurements.*—At high stages by wading; permanent three-foot weir installed in 1914 for measuring the ordinary flow.

*Winter flow.*—Station not maintained during the winter.

*Observer.*—D. H. Pollock.

## DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Pollock's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 2	M. H. French	5.2	4.94	1.88	4.15	9.30
April 8	do	4.2	5.96	0.79	1.99	4.70
April 16	do	4.5	2.53	0.96	1.87	2.40
May 11	J. E. Caughey	6.1	3.75	1.00	1.91	3.80
June 1	do				1.45	0.94 <sup>a</sup>
July 7	do				1.43	0.57 <sup>a</sup>
July 29	do	2.5	1.67	0.79	1.81	1.28
Aug. 20	do	5.0	2.81	0.68	1.76	1.91
Sept. 8	G. H. Whyte and J. E. Caughey	2.0	1.22	0.93	1.72	1.14
Sept. 21	J. E. Caughey				1.71	1.32 <sup>a</sup>
Oct. 11	do	2.0	1.10	1.29	1.72	1.42
Oct. 26	do				1.68	1.32 <sup>a</sup>

<sup>a</sup> Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Pollock's Ranch, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.63	1.42	1.73	2.31
2	4.15	9.30	1.62	1.40	2.12	6.26
3	4.75	8.53 <sup>a</sup>	1.62	1.42	1.78	2.66
4	4.50	7.76	1.62	1.44	1.76	2.52
5	2.79	7.00	1.61	1.40	1.76	2.52
6	2.19	6.24	1.61	1.42	1.70	2.10
7	2.09	5.47 <sup>b</sup>	1.62	1.48	1.65	1.83
8	1.99	4.70	1.61	1.44	1.57	1.43
9	1.99 <sup>b</sup>	4.58	1.61	1.46	1.55	1.34
10	1.99	4.44	1.60	1.42	1.52	1.21
11	1.99	4.30	1.61	1.50	1.45	0.96
12	1.99	4.16	1.62	1.58	1.45 <sup>c</sup>	0.94
13	2.04	4.54	1.63	1.64	1.45	0.92
14	1.99	3.80	1.75	2.26	1.45	0.91
15	1.97	3.40	2.29	8.40	1.45	0.90
16	1.87	2.40	2.19	7.06	1.45	0.89
17	1.85	2.30	1.64 <sup>b</sup>	1.78	1.45	0.88
18	1.79	1.98	1.75	2.45	1.45	0.86
19	1.77	1.88	1.74	2.38	2.45	10.20
20	1.75	1.80	1.74	2.38	2.00	4.32
21	1.73	1.71	1.74	2.38	1.79	2.40
22	1.73	1.74	1.74	2.38	1.65	1.88
23	1.72	1.70	1.75	2.45	1.48	0.89
24	1.60	1.56	1.76	2.52	1.46	0.82
25	1.67	1.48	1.78	2.66	1.45	0.78
26	1.63	1.32	1.95	4.28	1.45	1.08
27	1.64	1.40	1.75	2.45	1.45	0.86
28	1.63	1.38	1.76	2.52	1.44	0.74
29	1.62	1.34	1.76	2.52	1.45	0.72
30	1.63	1.36	1.75	2.45	1.45	0.88
31			1.72	2.34		

<sup>a</sup> to <sup>a</sup> Discharge interpolated.

<sup>b</sup> to <sup>b</sup> and <sup>c</sup> to <sup>c</sup> Shifting conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Pollock's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.49c	0.82	1.80	1.36	1.62	1.02	1.70	1.30
2	1.46	0.72	1.80	1.40	1.64	1.06	1.72	1.39
3	1.45	0.68	1.76	1.29	1.65	1.07	1.73	1.65
4	1.45	0.66	1.75	1.29	1.71	1.24	1.77	1.61
5	1.45	0.64	1.72	1.22	1.72	1.23	1.80	1.74
6	1.45c	0.63	1.70	1.18	1.72	1.20	1.95	2.65
7	1.45	0.62	1.68	1.14	1.73	1.21	1.80	1.74
8	1.43d	0.57	1.65	1.07	1.73	1.15	1.75	1.52
9	1.45	0.62	1.65	1.10	1.74	1.22	1.75	1.52
10	1.47	0.66	1.65	1.13	1.75	1.28	1.90	2.30
11	1.50	0.70	1.84	1.12	1.75	1.30	1.80	1.74
12	1.52	0.76	1.85	1.19	2.00	2.65	1.75	1.52
13	1.55	0.82	1.65	1.21	1.90	2.04	1.75	1.43
14	1.55	0.81	1.65	1.24	1.90	2.06	1.71	1.34
15	1.47	0.84	2.00	3.34	1.85	1.82	1.71	1.34
16	1.47	0.83	1.90	2.62	1.79	1.56	1.70	1.30
17	2.15	4.10	1.65	1.33	1.75	1.42	1.70	1.30
18	2.10	3.60	1.65	1.36	1.73	1.36	1.70	1.30
19	1.85	2.04	2.00	3.60	1.72	1.34	1.70	1.30
20	1.84	1.68	1.76	1.91	1.72d	1.36	1.70	1.30
21	1.83	1.60	1.75	1.83	1.71	1.32	1.70	1.30
22	1.80	1.46	1.75	1.80	1.71	1.34	1.70	1.30
23	2.20	4.26	1.75	1.78	1.70	1.30	1.69	1.27
24	2.00	2.46	1.74	1.68	1.71	1.34	1.69	1.27
25	1.90	1.80	1.73	1.60	1.70	1.30	1.68	1.24
26	1.86	1.58	1.70	1.45	1.70	1.30	1.68	1.24
27	1.80	1.30	1.70	1.43	1.72	1.39	1.67	1.21
28	1.80	1.28	1.69	1.36	1.73	1.43	1.66	1.18
29	1.80	1.26	1.65	1.20	1.71	1.34	1.68	1.24
30	1.80	1.28	1.62	1.07	1.70	1.30	1.68	1.24
31	1.80	1.32	1.62	1.05			1.67	1.21

c to c and d to d Shifting conditions.

MONTHLY DISCHARGE of Swiftcurrent Creek at Pollock's Ranch, for 1915.

(Drainage area 16 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (2-30)	9.3	1.3	3.6	0.225	0.24	207
May	8.4	1.4	2.4	0.150	0.17	148
June	10.2	0.7	1.9	0.119	0.13	113
July	4.2	0.6	1.4	0.088	0.10	86
August	3.6	1.0	1.5	0.094	0.11	92
September	2.6	1.0	1.4	0.088	0.10	83
October	2.6	1.2	1.4	0.088	0.10	86
The period					0.95	815

AXTON DITCH FROM SPING COULEE.

Location.—On NE.  $\frac{1}{4}$  Sec. 26, Tp. 7, Rge. 21, W. 3rd Mer., near South Fork Post Office.

Records available.—Gauge heights for the period June 10 to July 9, 1914.

Gauge.—Vertical staff. Zero elevation. 3014.01 feet.

Bench-mark.—Iron bench-mark. Elevation, 3015.96 feet.

Observer.—J. W. E. Axton.

Remarks.—J. E. Caughey visited this station on May 18, June 11 and July 7, 1915, and reported no flow on each occasion.

## SESSIONAL PAPER No. 25c

## JONES CREEK AT STEARNS' RANCH.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 20, Tp. 8, Rge. 20, W. 3rd Mer.

*Records available.*—May 15, 1912, to September 12, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 93.14 since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of clay and sand.

*Discharge measurements.*—Made by wading or with a weir.

*Winter flow.*—Station not maintained during winter.

*Observer.*—C. E. Stearns.

## DISCHARGE MEASUREMENTS of Jones Creek at Stearns' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 16.....	M. H. French.....	4.0	2.30	1.32	1.25	3.00
May 18.....	J. E. Caughey.....	3.5	5.80	0.90	1.45	5.10
June 10.....	do.....	3.3	2.16	1.16	0.82	2.50
July 6.....	do.....	5.2	1.84	0.92	0.75	1.69
July 28.....	do.....	5.4	2.15	0.98	0.79	2.10
Aug. 19.....	do.....	2.7	1.10	0.84	0.66	0.92
Sept. 8.....	G. H. Whyte and J. E. Caughey	5.3	1.45	0.58	0.67	0.85
Sept. 21.....	J. E. Caughey.....				0.64	0.60a
Oct. 11.....	do.....				0.70	1.36a
Oct. 26.....	do.....				0.64	0.60a

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Jones Creek at Stearns' Ranch, for 1915.

DAY.	March.		April.		May.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			5.00a	3.00	0.76	0.56
2			4.96	4.00	0.74	0.50
3			4.76	5.00	0.72a	0.45
4			4.76	6.00	0.71	0.40
5			4.00a	8.00	0.70	0.40
6			3.13	10.00a	0.69a	0.38
7			2.80a	24.00	0.68	0.26
8			2.51	20.00	0.68	0.26
9			2.11	15.00	0.67a	0.24
10			1.96	12.70	0.66	0.22
11			1.95a	12.60	0.64	0.28
12			1.93a	12.20	0.64	0.28
13			1.91	12.00	0.80a	0.60
14			1.43	4.80	2.11	15.20
15			1.35a	3.90	2.75	24.00
16			1.25	3.00	2.60a	17.20
17			1.20	2.60	1.70a	8.80
18			1.17	2.40	1.48	5.11
19			1.10a	1.94	1.28	2.88
20			1.04	1.62	1.04	1.82
21			1.00	1.40	1.00a	1.40
22			0.97	1.28	0.98	1.20
23			0.95a	1.20	0.90a	1.20
24	6.32	1.00b	0.92	1.08	0.85	0.80
25	5.37	1.60	0.85	0.80	1.00a	1.40
26	5.15a	2.00				
27			5.00a	2.00	0.82a	0.73
28			5.00a	2.60	0.79	0.67
29			5.00a	2.00	0.78a	0.61
30			5.00a	2.00	0.72	0.58
31			5.00a	2.00	0.77	0.88

a Gauge height interpolated.

b to c Ice conditions, discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Jones Creek at Stearns' Ranch, for 1915.—*Concluded.*

DAY.	June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.00a	13.30	0.85a	2.80	0.75	1.70	0.60	0.50
2.....	2.50	26.00	0.81	2.30	0.73	1.50	0.59	0.46
3.....	2.35	24.00	0.80	2.20	0.70	1.20	0.60a	0.50
4.....	1.64	13.70	0.80	2.20	0.70a	1.20	0.61a	0.57
5.....	1.28	8.60	0.77a	1.90	0.69a	1.13	0.62a	0.64
6.....	1.10a	6.10	0.75	1.70	0.68	1.06	0.63a	0.71
7.....	0.98	4.40	1.02	5.00	0.68	1.06	0.64a	0.78
8.....	0.90a	3.40	0.90a	3.40	0.67	0.99	0.65a	0.85
9.....	0.82	2.40	0.80	2.20	0.66	0.92	0.66	0.92
10.....	0.82	2.40	0.80	2.20	0.65	0.85	0.66	0.92
11.....	0.80	2.20	0.78a	2.00	0.65	0.85	0.67	0.99
12.....	0.79a	2.10	0.75	1.70	0.65a	0.85	0.68b	1.06
13.....	0.78	2.00	0.75	1.70	0.65a	0.85		
14.....	0.85	2.80	0.95	4.00	0.65	0.85		
15.....	0.85a	2.40	0.90	3.40	0.65	0.85		
16.....	0.80	2.20	0.87	3.00	0.65	0.85		
17.....	0.80	2.20	0.95a	4.00	0.64	0.78		
18.....	0.79	2.10	1.00	4.70	0.65a	0.85		
19.....	3.30	37.00	0.87	3.00	0.66	0.92		
20.....	3.50	40.00	0.78	2.00	0.65a	0.85		
21.....	2.00a	18.70	0.75	1.70	0.65	0.85		
22.....	1.30	8.90	0.73	1.50	0.65a	0.85		
23.....	1.01	4.80	0.85a	2.80	0.64a	0.78		
24.....	0.90	3.40	1.00	4.70	0.64	0.78		
25.....	0.95a	4.00	0.98	4.40	0.64	0.78		
26.....	1.01	4.80	0.90	3.40	0.63a	0.71		
27.....	0.98	4.40	0.85a	2.80	0.63	0.71		
28.....	0.95	4.00	0.79	2.10	0.62	0.64		
29.....	0.90	3.40	0.77	1.90	0.62	0.64		
30.....	0.90a	3.40	0.77	1.90	0.61a	0.57		
31.....			0.76	1.80	0.60	0.50		

a Gauge height interpolated.

b No gauge height observations after this date.

## MONTHLY DISCHARGE of Jones Creek at Stearns' Ranch, for 1915.

(Drainage area 23 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (23-31).....	2.00	1.00	1.78	0.077	0.03	32
April.....	24.00	0.58	5.80	0.252	0.28	345
May.....	24.00	0.28	3.00	0.130	0.15	184
June.....	40.00	2.00	8.60	0.374	0.42	512
July.....	5.00	1.50	2.70	0.117	0.14	166
August.....	1.70	0.50	0.90	0.039	0.04	55
September (1-12).....	1.06	0.46	0.74	0.032	0.01	17
The period.....					1.07	1,311

# MONTHLY DISCHARGE of Jones Creek at Stearns' Ranch, for 1914.

(Drainage area 23 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	18.20	2.10	6.93	0.301	0.34	412
May.....	2.30	0.88	1.77	0.077	0.09	109
June.....	2.50	0.34	1.12	0.049	0.05	67
July.....	0.51	0.00	0.13	0.005	0.01	8
August.....						Nil.
September.....						"
October.....						"
The period.....					0.49	596

NOTE.—This table is inserted in this report to correct a table which was published on page 401 of the report for 1914.





## SESSIONAL PAPER No. 25c

## STEARNS BROS. SOUTH DITCH NEAR LEITCHVILLE.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 9, Tp. 9, Rge. 20, W. 3rd Mer.

*Gauge.*—Vertical staff just above weir. Elevation of zero of gauge maintained at 110.53 feet since establishment. Elevation of crest of weir maintained at 111.39 feet since establishment.

*Bench-mark.*—One bench-mark used for both north and south ditches; seven-eighths inch iron pin located four feet to the right and two feet above the weir in the north ditch. Assumed elevation, 100.00 feet.

*Channel.*—One, heavy loam bed.

*Discharge measurements.*—Made by a weir.

*Observer.*—Stearns Bros.

*Remarks.*—This station was established by M. Gurofsky on July 21, 1915. No records were obtained in 1915.

## STEARNS BROS. NORTH DITCH NEAR LEITCHVILLE.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 9, Tp. 9, Rge. 20, W. 3rd Mer.

*Gauge.*—Vertical staff, situated on the right side of the ditch and 300 feet below the head-gate. Zero elevation maintained at 98.67 feet since establishment. Elevation of crest of weir maintained at 99.14 feet since establishment.

*Bench-mark.*—Seven-eighths inch iron pin, located four feet to the right and two feet above the weir. Assumed elevation, 100.00 feet.

*Channel.*—One, heavy loam bed.

*Discharge measurements.*—Made by a weir.

*Observer.*—Stearns Bros.

*Remarks.*—This station was established July 21, 1915, by M. Gurofsky. No records were obtained in 1915.

## SINCLAIR SOUTH DITCH NEAR GULL LAKE.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 18, Tp. 10, Rge. 19, W. 3rd Mer.

*Gauge.*—Vertical staff, situated on the right side of the ditch and 300 feet below the head-gate. Zero elevation maintained at 97.72 feet since establishment. Elevation of crest of weir maintained at 98.32 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark four feet to the right and two feet above the weir. Assumed elevation, 100.00 feet.

*Channel.*—One channel at all stages, clay loam bed.

*Discharge measurements.*—Made by a weir.

*Observer.*—K. Sinclair.

*Remarks.*—This station was established on July 22, 1915, by M. H. French. No records were obtained in 1915.

## SWIFTCURRENT CREEK AT SINCLAIR'S RANCH (UPPER STATION).

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 18, Tp. 10, Rge. 19, W. 3rd Mer., above the mouth of Bone Creek.

*Records available.*—June 15, 1910, to October 31, 1915.

*Gauge.*—Vertical staff. Zero was maintained at 87.91 feet during 1910-11 and at 87.86 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made with meter, and by weir at low stages.

*Winter flow.*—This station is not maintained during the winter.

*Diversions.*—Messrs. D. H. Pollock and J. W. E. Axton divert water for irrigation purposes above this station.

*Observer.*—Mrs. K. Sinclair.

*Remarks.*—Records at this station are affected by backwater from Bone Creek at certain stages of that stream.

## DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Sinclair's Ranch (Upper Station), in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 17.....	M. H. French.....	14.0	13.92	1.33	1.25	18.60
May 19.....	J. E. Caughey.....	13.5	15.55	1.42	1.41	22.00
June 9.....	do.....	10.5	9.39	1.48	0.92	13.90
June 29.....	do.....	10.2	11.34	1.40	1.17	16.00
July 26.....	do.....	12.5	9.45	0.67	0.90	6.40
Aug. 18.....	do.....	10.5	3.70	0.49	0.51	1.82
Sept. 6.....	G. H. Whyte and J. E. Caughey.....	11.0	4.13	0.53	0.56	2.20
Sept. 20.....	J. E. Caughey.....	11.5	6.15	0.67	0.72	4.10
Oct. 9.....	do.....	13.0	7.75	0.71	0.86	5.50
Oct. 25.....	do.....	11.0	2.87	1.04	0.64	3.00

## DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch (Upper Station), for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			5.00		0.51	7.1	0.73	9.8
2.....			5.25		0.50	7.0	0.76	10.2
3.....			5.65		0.49	6.9	0.98	13.5
4.....			6.00		0.49	6.9	1.01	14.0
5.....			5.25		0.48	6.8	1.13	16.1
6.....			4.75		0.50	7.0	1.21	17.7
7.....			4.60		0.50	7.0	1.27	19.0
8.....			4.40		0.50	7.0	0.99	13.6
9.....			4.00		0.50	7.0	0.92	12.5
10.....			3.25		0.51	7.1	0.92	12.5
11.....			2.75		0.51	7.1	0.91	12.4
12.....			2.35 <sup>a</sup>		0.52	7.2	0.88	11.9
13.....			1.55	27.0	0.54	7.4	0.84	11.4
14.....			1.50	25.0	1.25	18.6	0.77	10.4
15.....			1.50	25.0	2.75	75.0	0.73	9.8
16.....			1.48	25.0	4.65	151.0	0.70	9.4
17.....			1.25	18.6	4.54	147.0	0.70	9.4
18.....			1.23	18.1	2.55	67.0	0.71	9.5
19.....			1.20	17.5	1.45	24.0	0.78	10.5
20.....			1.18	17.1	1.26	18.8	2.00	45.0
21.....			1.05	14.6	1.26	18.8	2.30	57.0
22.....			0.97	13.3	1.24	18.3	2.22	54.0
23.....			0.75	10.1	1.20	17.5	2.00	45.0
24.....			0.67	9.0	1.22	17.9	1.98	44.0
25.....			0.68	9.1	1.29	19.4	2.00	45.0
26.....			0.70	9.4	1.20	17.5	2.10	49.0
27.....			0.64	8.6	1.00	13.8	2.11	49.0
28.....			0.58	7.8	0.98	13.5	1.70	33.0
29.....	6.75 <sup>a</sup>		0.56	7.6	0.88	11.9	1.17	16.9
30.....	6.25		0.53	7.3	0.81	10.9	1.20	17.5
31.....	6.00				0.76	10.2		

<sup>a</sup> to <sup>b</sup> Ice conditions and affected by backwater from Bone Creek.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE OF Swiftcurrent Creek at Sinclair's Ranch (Upper Station), for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.25	18.6	0.75	4.20	0.35	1.00	0.62	2.80
2.....	1.28	19.2	0.74	4.10	0.50	1.90	6.63	2.90
3.....	1.57	28.0	0.74	4.10	0.69	3.50	0.81	4.90
4.....	1.25	18.5	0.68	3.40	0.70	3.60	0.95	7.00
5.....	1.00	13.8	0.66	3.20	0.68	3.40	0.94	6.90
6.....	3.00	64.0	0.65	3.10	0.56	2.30	0.94	6.90
7.....	2.89	61.0	0.65	3.10	0.34	2.20	0.95	7.00
8.....	2.50	49.0	0.64	3.00	0.35	2.10	0.86	5.60
9.....	2.00	34.0	0.62	2.80	0.52	2.00	0.86	5.60
10.....	1.30	14.0	0.60	2.60	0.53	2.10	0.71	3.70
11.....	1.00	7.9	0.60	2.60	0.54	2.20	0.69	3.50
12.....	0.92	6.5	0.59	2.50	0.56	2.30	0.68	3.40
13.....	0.85	5.5	0.59	2.50	0.62	2.80	0.67	3.30
14.....	0.88	5.9	0.59	2.50	0.76	4.30	0.59	2.50
15.....	0.85	5.5	0.57	2.40	0.79	4.70	0.60	2.60
16.....	0.81	4.9	0.53	2.10	0.77	4.40	0.57	2.40
17.....	0.89	6.1	0.50	1.90	0.72	3.80	0.55	2.20
18.....	0.91	6.4	0.48	1.76	0.70	3.60	0.52	2.00
19.....	1.14	10.5	0.49	1.83	0.70	3.60	0.50	1.90
20.....	0.97	7.4	0.47	1.69	0.71	3.70	0.50	1.90
21.....	0.89	6.1	0.45	1.55	0.72	3.80	0.49	1.83
22.....	0.85	5.5	0.45	1.55	0.70	3.60	0.49	1.83
23.....	0.82	5.1	0.44	1.48	0.69	3.50	0.56	2.30
24.....	0.82	5.1	0.40	1.20	0.67	3.30	0.56	2.30
25.....	0.84	5.4	0.41	1.27	0.65	3.10	0.62	2.80
26.....	0.90	6.2	0.40	1.20	0.65	3.10	0.66	3.20
27.....	0.89	6.1	0.37	1.05	0.66	3.20	0.65	3.10
28.....	0.85	5.5	0.36	1.04	0.65	3.10	0.67	3.20
29.....	0.82	5.1	0.36	1.04	0.64	3.00	0.66	3.20
30.....	0.80	4.8	0.37	1.08	0.64	3.00	0.65	3.10
31.....	0.75	4.2	0.36	1.04	.....	.....	0.64	3.00

## MONTHLY DISCHARGE OF Swiftcurrent Creek at Sinclair's Ranch (Upper Station), for 1915.

(Drainage area 172 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April (13-30).....	27.0	7.30	15.00	0.087	0.580	535
May.....	151.0	6.80	25.00	1.450	1.670	1,537
June.....	57.0	9.40	23.00	1.330	0.148	1,269
July.....	64.0	4.20	14.40	0.084	0.180	885
August.....	4.2	1.04	2.22	0.013	0.070	156
September.....	4.7	1.00	3.07	0.018	0.020	187
October.....	7.0	1.83	3.51	0.020	0.020	216
The period.....					2.638	4,861

## LEWIS DITCH AT KLINTONEL.

*Location.*—On NW.  $\frac{1}{4}$  Sec. 34, Tp. 8, Rge. 22, W. 3rd Mer., about one thousand feet below the headgate.

*Records available.*—August 20, 1915, to September 11, 1915.

*Gauge.*—Staff fastened to a post at the left bank. Zero elevation maintained at 94.25 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark on the right bank about eight feet southeast of the gauge. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made by meter at the section, or by weir in the ditch.

*Observer.*—C. L. Lewis.

*Remarks.*—This ditch takes its supply from a spring which enters Bone Creek above the gauging station.

## DISCHARGE MEASUREMENTS of Lewis Ditch at Klintonel, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Aug. 24.....	J. E. Caughey.....			<i>a</i>	9.26	0.079a

*a* Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Lewis Ditch at Klintonel, for 1915.

DAY.	August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.21	0.02
2.....			0.26	0.07
3.....			0.21	0.02
4.....			0.22	0.03
5.....			0.22	0.03
6.....			0.21	0.02
7.....			0.26	0.07
8.....			0.24	0.05
9.....			0.26	0.07
10.....			0.25	0.06
11.....			0.28	0.11
12.....				<i>b</i>
13.....				
14.....				
15.....				
16.....				
17.....				
18.....				
19.....				
20.....	0.21	0.02a		
21.....	0.21	0.02		
22.....	0.21	0.02		
23.....	0.21	0.02		
24.....	0.23	0.04		
25.....	0.25	0.06		
26.....	0.22	0.03		
27.....	0.21	0.02		
28.....	0.25	0.06		
29.....	0.20	0.01		
30.....	0.20	0.01		
31.....	0.20	0.01		

*a* Headgate opened.

*b* Headgate closed.

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Lewis Ditch at Klintonel, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
August (20-31).....	0.06	0.01	0.03	0.70
September (1-11).....	0.11	0.02	0.05	1.00
The period.....				1.70

## BONE CREEK AT LEWIS' RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 34, Tp. 8, Rge. 22, W. 3rd Mer., at Klintonel Post Office.

*Records available.*—July 1, 1908, October 31, 1915.

*Gauge.*—Vertical staff. The elevation of the zero has been maintained at 55.02 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.60 feet.

*Channel.*—Slightly shifting.

*Discharge measurements.*—Made with meter. or with weir at low stages.

*Winter flow.*—This station is not maintained during the winter.

*Observer.*—C. L. Lewis.

## DISCHARGE MEASUREMENTS of Bone Creek at Lewis' Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 6.....	J. E. Caughey .....	9.0	2.10	0.76	0.17	1.590
June 15.....	do .....	8.8	2.38	0.74	0.20	1.770
July 12.....	do .....	6.0	1.44	0.77	0.16	1.110
Aug. 4.....	do .....	9.0	2.12	0.61	0.17	1.290
Aug. 24.....	do .....				0.14	0.836a
Sept. 12.....	G. H. Whyte and J. E. Caughey .....				0.19	1.455a
Sept. 24.....	J. E. Caughey .....				0.18	1.407a
Oct. 13.....	do .....				0.21	1.750a

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Bone Creek at Lewis' Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			0.16	1.08	0.15	0.96	0.24	2.40
2.....			0.48	7.00	0.14	0.85	0.38	5.10
3.....			1.98	36.00	0.13	0.74	0.40	5.40
4.....			1.54	27.00	0.12	0.64	0.29	3.40
5.....			1.38	24.00	0.11	0.54	0.30	3.60
6.....			0.49	7.20	0.17	1.22	0.21	1.84
7.....			0.29	3.40	0.18	1.26	0.19	1.51
8.....			0.31	3.70	0.18	1.36	0.19	1.51
9.....			0.29	3.40	0.17	1.22	0.18	1.36
10.....			0.27	3.00	0.17	1.22	0.22	2.60
11.....			0.25	2.60	0.17	1.22	0.20	1.67
12.....	0.14	0.85	0.23	2.20	0.17	1.22	0.21	1.84
13.....	0.14	0.85	0.22	2.00	0.17	1.22	0.18	1.36
14.....	0.14	0.85	0.22	2.00	0.62	9.70	0.21	1.84
15.....	0.14	0.85	0.22	2.00	0.51	7.50	0.20	1.67
16.....	0.14	0.85	0.21	1.84	0.36	4.70	0.19	1.51
17.....	0.15	0.96	0.21	1.84	0.24	2.40	0.20	1.67
18.....	0.15	0.96	0.19	1.51	0.21	1.84	0.19	1.51
19.....	0.15	0.96	0.19	1.51	0.19	1.51	0.21	1.84
20.....	0.15	0.96	0.19	1.51	0.19	1.51	0.32	3.90
21.....	0.16	1.08	0.19	1.51	0.19	1.51	0.21	1.84
22.....	0.16	1.08	0.18	1.36	0.20	1.67	0.20	1.67
23.....	0.16	1.08	0.18	1.36	0.21	1.84	0.18	1.36
24.....	0.14	0.85	0.18	1.36	0.26	2.80	0.16	1.08
25.....	0.12	0.64	0.17	1.22	0.38	5.10	0.16	1.08
26.....	0.12	0.64	0.17	1.22	0.21	1.84	0.28	3.20
27.....	0.12	0.64	0.17	1.22	0.19	1.51	0.19	1.51
28.....	0.11	0.54	0.17	1.22	0.19	1.51	0.18	1.36
29.....	0.12	0.64	0.16	1.08	0.19	1.51	0.17	1.22
30.....	0.12	0.64	0.16	1.08	0.19	1.51	0.34	4.30
31.....	0.12	0.64			0.19	1.51		



## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE OF Bone Creek at Lewis' Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0 18	1 36	0 17	1 22	0 15	0 96	0 45	1 41
2.....	0 16	1 08	0 16	1 08	0 19	1 51	0 47	1 50
3.....	0 18	1 36	0 15	0 96	0 15	0 96	0 50	1 65
4.....	0 17	1 22	0 15	1 08	0 18	1 36	0 41	1 26
5.....	0 16	1 08	0 14	0 85	0 22	2 00	0 56c	1 94
6.....	0 16	1 08	0 14	0 85	0 14	0 85	0 21	1 84
7.....	0 18	1 36	0 15	0 96	0 18	1 36	0 22	2 00
8.....	0 34	4 30	0 14	0 85	0 17	1 22	0 22	2 00
9.....	0 19	1 51	0 13	0 74	0 18	1 36	0 21	1 84
10.....	0 21	1 84	0 12	0 64	0 17	1 22	0 52b	1 75
11.....	0 16	1 08	0 11	0 54	0 18	1 36	0 51	1 50
12.....	0 16	1 08	0 11	0 54	0 19	1 51	0 53	1 80
13.....	0 19	1 51	0 15	0 96	0 54b	1 85	0 50c	1 65
14.....	0 18a	1 36	0 17	1 22	0 53	1 80	0 20	1 67
15.....	0 17	1 22	0 15	0 96	0 46	1 46	0 22	2 00
16.....	0 19	1 51	0 12	0 64	0 41	1 26	0 22	2 00
17.....	0 23	2 20	0 14	0 85	0 40	1 22	0 23	2 20
18.....	0 20	1 67	0 14	0 85	0 42	1 27	0 23	2 20
19.....	0 17	1 22	0 15	0 96	0 45	1 55	0 23	2 20
20.....	0 16	1 08	0 17	1 22	0 42	1 27	0 23	2 20
21.....	0 15	0 96	0 17	1 22	0 41	1 26	0 24	2 40
22.....	0 15	0 96	0 14	0 85	0 40	1 22	0 25	2 60
23.....	0 21	1 84	0 13	0 74	0 40	1 22	0 24	2 40
24.....	0 21	1 84	0 14	0 85	0 43	1 32	0 23	2 20
25.....	0 19	1 51	0 14	0 85	0 44	1 36	0 23	2 20
26.....	0 18	1 36	0 13	0 74	0 44	1 36	0 23	2 20
27.....	0 17	1 22	0 13	0 74	0 46	1 46	0 23	2 20
28.....	0 21	1 84	0 16	1 08	0 45	1 41	0 22	2 00
29.....	0 20	1 67	0 12	0 64	0 44	1 36	0 22	2 00
30.....	0 17	1 22	0 12	0 64	0 44	1 36	0 22	2 00
31.....	0 19	1 51	0 12	0 64			0 22	2 00

a Gauge heights interpolated.

b to c Head on 18' rectangular weir.

## MONTHLY DISCHARGE of Bone Creek at Lewis' Ranch, for 1915.

(Drainage area 17 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (12-31)	1 08	0 64	0 83	0 049	0 04	33
April	36 00	1 08	4 90	0 288	0 32	292
May	9 70	0 54	2 10	0 124	0 14	129
June	5 46	1 08	2 20	0 129	0 14	131
July	4 30	0 96	1 50	0 088	0 10	92
August	1 22	0 54	0 87	0 051	0 06	53
September	2 00	0 85	1 37	0 081	0 09	82
October	2 60	1 26	1 97	0 116	0 13	121
The period					1 02	933

## SWIFTCURRENT CREEK AT SINCLAIR'S RANCH (LOWER STATION).

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 17, Tp. 10, Rge. 19, W. 3rd Mer., and below the mouth of Bone Creek.

*Records available.*—May 27, 1910, to October 31, 1915.

*Gauge.*—Chain gauge, attached to floor of highway bridge. The zero of the gauge was maintained at 85.73 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark located on the right bank about 600 feet upstream from the bridge. Assumed elevation, 160.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—Made with meter from bridge or by wading and with a weir at very low stages.

*Winter flow.*—This station is not maintained during the frozen season.

*Observer.*—Mrs. K. Sinclair.

# DISCHARGE MEASUREMENTS of Swiftcurrent Creek at Sinclair's Ranch (Lower Station), in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 17.....	M. H. French.....	36.0	37.20	1.29	2.99	48.0
May 19.....	J. E. Caughey.....	36.0	57.30	0.99	3.09	57.0
June 9.....	do.....	22.0	29.80	1.24	2.55	37.0
June 29.....	do.....	22.0	34.40	1.14	2.87	40.0
July 26.....	do.....	22.5	30.15	0.81	2.60	25.0
Aug. 18.....	do.....	20.0	17.75	0.48	2.08	8.5
Sept. 6.....	G.H. Whyte and J. E. Caughey.....	21.0	21.85	0.49	2.26	10.8
Sept. 20.....	J. E. Caughey.....	22.0	25.80	0.64	2.50	16.7
Oct. 9.....	do.....	22.0	31.20	0.87	2.69	27.0
Oct. 25.....	do.....	21.0	23.30	0.82	2.28	19.0

# DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch (Lower Station), for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec. ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			5.14	215	2.09	28	2.38	34
2.....			4.89	195	2.03	27	2.40	34
3.....			4.64	175	2.00	26	2.68	40
4.....			4.45	160	1.93	25	3.01	50
5.....			4.37	154	1.91	24	3.03	52
6.....			4.34	151	2.07	27	3.50	84
7.....			4.19	139	2.01	26	3.49	84
8.....			4.12	134	1.99	26	2.68	43
9.....			4.02	126	2.02	26	2.44	35
10.....			3.92	118	2.04	27	2.55a	37
11.....			3.68	98	2.04	27	2.50	35
12.....			3.46	81	2.04	27	2.47	35
13.....			3.29	67	2.10	26	2.45	34
14.....			3.20	63	3.20	60	2.43	33
15.....			3.14	57	4.10	132	2.42	33
16.....			3.12	56	5.90	276	2.40	32
17.....			2.99	49	4.40	156	2.39	32
18.....			2.86	45	3.90	116	2.40	32
19.....			2.79	43	3.24	63	2.42	32
20.....			2.64	39	2.82	44	3.95	111
21.....			2.57	37	2.81	44	4.15	130
22.....			2.43	35	2.80	43	4.00	114
23.....			2.42	34	2.76	42	3.81	99
24.....			2.13	29	2.79	43	3.89	103
25.....			2.40	34	2.80	43	3.90	113
26.....			2.47	35	2.77	42	4.30	136
27.....			2.39	34	2.67	40	4.35	139
28.....			2.32	32	2.59	38	3.95	105
29.....			7.68	418				
30.....			7.14	375	2.22	30	2.87a	40
31.....			6.64	335	2.12	28	2.42	49
			5.86	273		2.39	34	

a to a Shifting conditions.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch (Lower Station).  
for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.99	49.0	2.46	16.3	2.00	7.2	2.42	15.0
2	3.01	51.0	2.44	15.8	2.11	5.8	2.43	15.4
3	3.02	52.0	2.40	14.4	2.37	13.7	2.68	26.0
4	2.99	49.0	2.35	13.2	2.35	13.2	2.89	41.0
5	3.00	50.0	2.30	12.0	2.34	13.0	2.91	43.0
6	6.00	290.0	2.25	11.1	2.35	13.2	2.87	40.0
7	4.15	142.0	2.20	10.2	2.36	13.4	2.84	37.0
8	3.85	118.0	2.15	9.4	2.37	13.7	2.75	30.0
9	3.00	50.0	2.12	8.9	2.36	13.4	2.66 <sup>a</sup>	25.0
10	2.95	46.0	2.13	9.1	2.34	13.0	2.72	30.0
11	2.72	28.0	2.12	8.9	2.35	13.2	2.71	31.0
12	2.70	27.0	2.11	8.8	2.39	14.2	2.70	31.0
13	2.62	23.0	2.11	8.8	2.45	16.0	2.68	31.0
14	2.70	27.0	2.10	8.6	2.60	22.0	2.65	30.0
15	2.69	26.0	2.09	8.5	2.68	26.0	2.60	28.0
16	2.52	18.0	2.09	8.5	2.67	25.0	2.60	29.0
17	2.57	20.0	2.09	8.5	2.62	23.0	2.57	28.0
18	2.60	22.0	2.11	8.8	2.60	22.0	2.55	28.0
19	2.90	42.0	2.09	8.5	2.55	19.6	2.56	29.0
20	2.57	20.0	2.10	8.6	2.50	17.6	2.51	27.0
21	2.52	18.4	2.09	8.5	2.51	18.0	2.49	27.0
22	2.50	17.6	2.08	8.3	2.47	16.6	2.49	28.0
23	2.48	17.0	2.05	7.9	2.43	15.4	2.50	30.0
24	2.50	17.6	2.04	7.8	2.41	14.7	2.48	20.0
25	2.54	19.2	2.03	7.6	2.40	14.4	2.28 <sup>a</sup>	19.0
26	2.60	22.0	2.01	7.3	2.39	14.2	2.37	23.0
27	2.57	20.0	2.00	7.2	2.37	13.7	2.37	23.0
28	2.57	20.0	2.00	7.2	2.39	14.2	2.39	24.0
29	2.55	19.6	2.02	7.5	2.40	14.4	2.35	22.0
30	2.52	18.4	2.01	7.3	2.41	14.7	2.32	21.0
31	2.47	16.6	2.00	7.2			2.30	20.0

<sup>a</sup> to a Shifting conditions.

## MONTHLY DISCHARGE of Swiftcurrent Creek at Sinclair's Ranch (Lower Station), for 1915.

(Drainage area 366 square miles.)

MONTH.	DISCHARGE IN SECOND-FOOT.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (28-31)	418.0	273.0	350.0	0.956	0.142	2.778
April	215.0	28.0	83.1	0.227	0.250	4.945
May	276.0	24.0	52.0	0.143	0.160	3.228
June	139.0	32.0	64.0	0.175	0.200	3.808
July	290.0	16.6	43.8	0.120	0.140	2.693
August	16.3	7.2	9.4	0.026	0.030	57.8
September	26.0	7.2	15.7	0.043	0.048	95.4
October	43.0	15.0	27.8	0.076	0.088	1.709
The period					1.058	20.673

## SWIFTCURRENT CREEK NEAR SWIFT CURRENT UPPER STATION.

*Location.*—On SW.  $\frac{1}{4}$  Sec. 12, Tp. 15, Rge. 14, W. 3rd Mer., above the water supply dam of the city of Swift Current.*Records available.*—January 16, 1914, to December 31, 1915.*Gauge.*—Vertical staff at old section. Zero elevation, 91.72 feet since establishment. Vertical staff in forebay of permanent control. Zero elevation maintained at 97.03 feet during 1915. Crest of four foot weir is permanent control. Elevation, 98.58 feet.*Bench-mark.*—Painted top of pile of left abutment, upstream side, assumed elevation, 100.00

feet, at old section. Top of granite boulder thirty feet to left and twenty feet upstream from left end of concrete control. Assumed elevation, 100.00 feet.

*Control.*—Permanent.

*Discharge measurements.*—At high stages from bridge; at low stages by wading, or by weir.

*Winter flow.*—Affected by ice.

*Observer.*—Mrs. E. Mackintosh.

DISCHARGE MEASUREMENTS of Swiftcurrent Creek near Swift Current (Upper Station), in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 13.	J. E. Caughey				2.21	7.04
Feb. 19.	F. R. Steinberger				2.60	3.82
Mar. 15.	R. J. Srigley				2.50	Nil.
Mar. 27.	do	96.0	201.0	1.88	6.46b	379.0
Mar. 31.	do	85.0	180.0	2.07	6.31	373.0
Mar. 31.	H. B. R. Thompson	74.0	134.0	2.01	5.49b	268.0
April 14.	do	68.5	158.0	0.76	2.95	120.0
June 3.	F. K. Beach	44.5	57.0	0.92	2.60	52.0
June 25.	do	33.0	42.0	2.15	2.74	91.0
Aug. 4.	do	32.5	29.0	1.70	2.43	50.0
Aug. 27.	do	32.7	19.0	0.91	2.14	17.3
Sept. 25.	do	32.0	26.0	1.22	2.31	31.0
Oct. 21.	do	33.0	28.0	1.20	2.35	34.0
Nov. 10.	W. R. McCaffrey	40.0	37.0	0.70	2.20	26.0
Nov. 22.	do	32.0	18.2	1.21	2.14	22.0
Dec. 8.	do	34.0	20.0	1.14	2.09	23.0
Dec. 22.	do	22.0	10.7	0.85	1.75	9.1

*a* Weir measurement.

*b* Gauge height from gauge at traffic bridge.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek near Swift Current (Upper Station), for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.22a	7.6	2.50	4.0	3.07	6.9	5.30	250	2.51	51	2.63	66
2.	2.17	7.7	2.57	4.7	3.12	6.9	5.45	265	2.50	50	2.62	65
3.	2.12	7.9	2.77	5.4	3.12	6.7	6.55	398	2.50	50	2.60	62
4.	2.15	8.0	2.77	5.3	3.02	6.3	6.00b	325	2.49	49	2.60	62
5.	2.17	8.5	2.42	3.3	2.87	6.0	.....	988	2.49	49	2.68	74
6.	2.22	8.7	1.97	2.0	2.87	5.4	.....	296	2.49	49	2.86	108
7.	2.26	9.0	1.95	1.2	2.87	5.0	.....	610	2.48	48	2.95	127
8.	2.33	9.0	1.92	1.0	2.82	4.1	.....	404	2.48	48	2.93	123
9.	2.89	9.0	1.92	1.7	2.67	3.5	.....	284	2.48	48	2.89	114
10.	3.52	8.6	1.95	2.2	2.62	2.8	.....	239	2.47	47	2.85	106
11.	2.41	8.0	1.97	3.0	2.52	2.0	.....	194	2.47	47	2.80	95
12.	2.27	7.4	2.07	3.2	2.47	1.0	.....	184	2.46	46	2.76	88
13.	2.21	7.0	2.17	3.3	2.42	0.7	.....	154	2.45	46	2.76	77
14.	2.19	6.5	2.12	3.4	2.42	0.2	2.95	127	2.45	46	2.65	70
15.	2.17	6.2	2.22	3.4	2.51	Nil.	2.95	127	2.50	50	2.63	66
16.	2.17	6.0	2.32	3.5	2.67	16.0	2.93	123	2.70	77	2.60	62
17.	2.17	5.8	2.54	3.6	2.87	22.0	2.90	116	2.70	77	2.58	60
18.	2.17	5.8	2.54	3.7	3.12	29.0	2.90	116	2.70	77	2.52	52
19.	2.17	5.5	2.69	3.8	3.32	35.0	2.87	110	3.20	185	2.50	50
20.	2.17	5.1	2.77	4.0	3.35	38.0	2.83	101	3.00	138	2.59	61
21.	.....	4.9	2.82	4.0	3.37	42.0	2.79	93	2.96	129	2.67	72
22.	2.15	4.1	2.77	4.1	3.77	111.0	2.75	86	2.90	116	2.80	95
23.	2.12	4.0	2.87	4.4	3.87	237.0	2.70	77	2.84	103	2.89	114
24.	2.09	4.0	2.92	4.8	4.87a	266.0	2.65	70	2.75	86	2.87	110
25.	2.07	3.8	2.95	5.1	6.46b	355.0	2.60	62	2.60	62	2.74	84
26.	2.07	3.7	2.97	5.5	6.52	394.0	2.60	62	2.65	70	2.70	77
27.	2.05	3.6	3.02	6.0	6.31	364.0	2.59	61	2.68	74	2.75	86
28.	2.05	3.5	3.07	6.3	5.78	299.0	2.57	58	2.70	77	2.89	114
29.	2.12	3.4	.....	.....	6.50	391.0	2.56	57	2.60	76	2.92	120
30.	2.26	3.3	.....	.....	5.90	313.0	2.53	54	2.67	72	2.92	120
31.	2.37	3.6	.....	.....	5.49	269.0	.....	.....	2.65	70	.....	.....

*a* to *a* Ice conditions.

*b* to *b* Gauge at bridge.

*c* to *c* Gauge gone. Estimate from lower station.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftpcurrent Creek near Swift Current (Upper Station), for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.90	116	2.50	50	2.17	24	2.34	36	2.38	39	.....	2.5
2.....	2.87	110	2.49	49	2.20	26	2.34	36	2.37	39	.....	3.3
3.....	2.85	106	2.45	46	2.22	27	2.35	37	2.37	39	2.04	20.0
4.....	2.81	97	2.43	44	2.21	27	2.35	37	2.36	38	2.15	26.0
5.....	2.77	90	2.41	42	2.20	26	2.35	37	2.35	37	2.20	27.0
6.....	2.75	86	2.39	40	2.20	26	2.36	38	2.33	35	2.24	25.0
7.....	2.70	77	2.37	39	2.19	25	2.36	38	2.32	35	2.25	26.0
8.....	2.68	74	2.35	37	2.19	25	2.38	39	2.27	31	2.09	23.0
9.....	2.65	70	2.30	33	2.20	26	2.40	41	2.25	30	1.95	14.8
10.....	2.69	76	2.28	32	2.20	26	2.43	44	2.20	26	1.92	14.0
11.....	3.10	161	2.26	39	2.20	26	2.45	46	2.15	23	1.89	13.8
12.....	3.00	138	2.22	27	2.21	27	2.46	46	2.10	20	1.87	13.0
13.....	2.93	123	2.20	26	2.21	27	2.47	47	2.08	19	1.85	12.0
14.....	2.84	103	2.18	25	2.22	27	2.47	47	2.05	18	1.83	11.0
15.....	2.77	90	2.18	25	2.22	27	2.45	46	2.09	20	1.80	9.0
16.....	2.74	84	2.18	25	2.23	28	2.41	42	2.14	22	1.75	7.0
17.....	2.71	79	2.18	25	2.23	28	2.40	41	2.24	29	1.67	6.0
18.....	2.68	74	2.18	25	2.24	29	.....	40	2.22	27	1.55	6.0
19.....	2.64	68	2.17	24	2.25	30	.....	39	2.20	26	1.65	6.0
20.....	2.70	77	2.17	24	2.26	30	.....	38	.....	25	1.80	8.5
21.....	2.69	76	2.17	24	2.28	32	2.35	37	.....	23	1.80	9.1
22.....	2.65	70	2.17	24	2.30	33	2.34	36	2.14	22	1.78	9.1
23.....	2.50	50	2.17	24	2.30	33	2.33	35	2.14	22	1.70	9.0
24.....	2.47	47	2.16	24	2.31	34	2.33	35	2.13	23	1.60	8.7
25.....	2.45	46	2.16	24	2.31	34	2.33	35	2.13	23	1.47	8.4
26.....	2.41	42	2.16	24	2.32	35	2.32	35	2.10	20	1.35	8.0
27.....	2.43	44	2.14	22	2.32	35	2.32	35	2.04	17	1.28	7.8
28.....	2.48	48	2.14	22	2.33	35	2.33	35	.....	2	1.20	7.5
29.....	2.55	56	2.14	22	2.33	35	2.34	36	.....	2	1.15	7.2
30.....	2.53	54	2.13	22	2.34	36	2.36	38	.....	2	1.12	7.0
31.....	2.50	50	2.13	22	.....	.....	2.38	39	.....	.....	1.08	6.8

## MONTHLY DISCHARGE of Swiftpcurrent Creek near Swift Current (Upper Station), for 1915.

(Drainage area 975 square miles.)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	9.0	3.3	6.1	0.0063	0.007	375
February.....	6.3	1.0	3.8	0.0039	0.004	211
March.....	394.0	Nil.	105.0	0.1077	0.124	6,456
April.....	988.0	54.0	203.0	0.2082	0.242	12,079
May.....	185.0	46.0	71.0	0.0728	0.084	4,366
June.....	127.0	50.0	86.0	0.0882	0.098	5,117
July.....	161.0	42.0	80.0	0.0825	0.095	4,919
August.....	50.0	22.0	30.0	0.0308	0.050	1,845
September.....	36.0	24.0	29.0	0.0298	0.033	1,726
October.....	47.0	35.0	39.0	0.0400	0.046	2,308
November.....	39.0	2.0	24.0	0.0246	0.027	1,428
December.....	27.0	2.5	11.7	0.0120	0.014	719
The year.....					0.800	41,629

## SWIFTCURRENT CREEK (LOWER STATION) NEAR SWIFT CURRENT.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 18, Tp. 15, Rge. 13, W. 3rd Mer., below the water supply dam of the city of Swift Current.

*Records available.*—May 5, 1913, to December 31, 1915.

*Gauge.*—Vertical staff. Zero elevation of gauge has been maintained at 87.195 feet since establishment.

*Bench-marks.*—On rock. Assumed elevation up to June 11, 1914, 100.00 feet From June

12, 1914, to December 31, 1915, another rock has been used having an elevation of 97.24 feet above the same datum.

Channel.—Permanent.

Discharge measurements.—By wading or from bridge.

Winter flow.—Affected by ice.

Artificial control.—The flow of the creek at this point is affected to some extent by the city water supply dam.

Relation of gauge height to discharge.—Affected during spring by growth of weeds.

Observer.—Stanley Tite.

DISCHARGE MEASUREMENTS of Swiftcurrent Creek near Swift Current (Lower Station), in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 13.	J. E. Caughey	21 0	14 2	0.64	0.70	9.1
Feb. 17.	F. R. Steinberger	21.0	10.5	0.29	0.59	3.0
Mar. 15.	R. J. Srigley	23.5	14.1	0.85	0.78	11.9
Mar. 25.	do	51.0	160.0	3.09	2.71	494.0
Mar. 31.	H. B. R. Thompson	54.0	172.0	4.25	2.34	308.0
April 14.	do	62.3	80.0	1.76	1.63	140.0
June 4.	F. K. Beach	46.0	66.0	0.78	4.34	51.0
June 25.	do	47.7	85.0	1.17	1.62	100.0
Aug. 4.	do	47.0	67.0	0.72	1.21	48.0
Aug. 27.	do	46.7	47.0	2.27	1.00	10.7
Sept. 25.	do	26.0	35.0	0.69	1.14	24.0
Oct. 21.	do	26.0	35.0	0.79	1.18	28.0
Nov. 10.	W. R. McCaffrey	25.5	34.0	0.70	1.11	24.0
Nov. 22.	do	27.0	31.0	0.59	1.12	18.6
Dec. 8.	do	25.0	30.0	0.54	1.07	16.0
Dec. 22.	do	22.0	23.0	0.53	0.87	12.1

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek near Swift Current (Lower Station), for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	0.50 <sup>a</sup>	5.1	0.64	3.0	0.67	3.5	2.30	296	1.15	61	1.36	56
2.	0.51	5.0	0.59	3.0	0.67	3.7	2.50	377	1.15	60	1.36	55
3.	0.47	4.9	0.64	3.0	0.68	3.8	2.75	520	1.15	59	1.36	54
4.	0.48	4.3	0.54	3.0	0.68	3.9	3.05	700	1.15	59	1.34 <sup>c</sup>	50
5.	0.54	4.3	0.55	3.0	0.70	4.0	3.53	988	1.15	58	1.34	50
6.	0.60	4.6	0.55	3.0	0.70	4.5	2.30	296	1.15	57	1.54	85
7.	0.62	5.0	0.56	3.0	0.70	5.0	2.90	610	1.15	57	1.59	94
8.	0.66	6.0	0.58	3.0	0.72	5.3	2.55	404	1.15	56	1.61	98
9.	0.67	7.0	0.56	3.0	0.74	6.0	2.26	284	1.15	56	1.54	85
10.	0.69	7.3	0.56	3.0	0.75	6.4	2.10	239	1.15	55	1.44	66
11.	0.75	7.9	0.56	3.0	0.80	7.0	1.91	194	1.10	50	1.38	56
12.	0.81	8.9	0.56	3.0	0.85	7.0	1.86	184	1.10	49	1.33	48
13.	0.70	9.1	0.56	3.0	0.80	7.3	1.71	154	1.15	53	1.33	48
14.	0.70	8.5	0.56	3.0	0.80	9.0	1.65	144	1.25	62	1.23	35
15.	0.65	7.8	0.56	3.0	0.80 <sup>a</sup>	11.9	1.60 <sup>c</sup>	134	1.35	73	1.33	4 <sup>x</sup>
16.	0.66	7.0	0.56	3.0	0.83 <sup>b</sup>	16.0	1.56	126	1.45	83	1.48	73
17.	0.66	6.0	0.56	3.0	0.90	22.0	1.55	124	1.50	89	1.33	48
18.	0.66	5.1	0.56	3.0	0.95	29.0	1.50	115	1.75	127	1.28	41
19.	0.66	4.7	0.61	3.0	1.00	35.0	1.50	114	1.82	137	1.33	48
20.	0.61	3.8	0.61	3.0	0.99	38.0	1.45	106	1.65	108	1.29	43
21.	0.72	3.8	0.61	3.0	1.00	42.0	1.40	98	1.55	91	1.33	48
22.	0.72	3.7	0.61	3.0	1.55	111.0	1.40	97	1.45	77	1.43	64
23.	0.72	3.6	0.66	3.2	2.15	237.0	1.40	96	1.45	78	1.63	102
24.	0.67	3.6	0.66	3.3	2.22 <sup>b</sup>	266.0	1.40	95	1.39	67	1.63	102
25.	0.67	3.4	0.61	3.3	2.71	496.0	1.30	51	1.35	59	1.62	100
26.	0.68	3.4	0.66	3.3	3.00	670.0	1.30	80	1.45	76	1.60	96
27.	0.79	3.3	0.66	3.3	2.55	404.0	1.25	74	1.50	84	1.88	159
28.	0.73	3.2	0.56	3.3	2.30	296.0	1.25	73	1.45	75	1.70	116
29.	0.68	3.2			2.30	296.0	1.20	67	1.45	74	1.70	116
30.	0.58	3.2			2.30	296.0	1.15	61	1.45	73	1.65	106
31.	0.65	3.1			2.35	314.0			1.43	68		

a to a Ice conditions.

b to b Shifting conditions.

c to c Shifting conditions.



SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent Creek near Swift Current (Lower Station), for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.60	96	1.42	63.0	0.99	10.8	1.12	22	1.10	20.0	1.00	11.5
2.....	1.52	81	1.42	63.0	1.01	12.4	1.15	26	1.10	20.0	1.00	11.5
3.....	1.50	77	1.30	44.0	1.07	17.4	1.20	31	1.05	15.8	1.00	11.5
4.....	1.48	73	1.30	44.0	1.07	17.4	1.20	31	1.10	20.0	1.05	13.8
5.....	1.45	68	1.30	44.0	1.07	17.4	1.20	31	1.10	20.0	1.05	15.8
6.....	1.45	68	1.30	44.0	1.01	12.4	1.25	38	1.14	24.0	1.05	15.8
7.....	1.43	64	1.30	44.0	1.06	16.6	1.27	40	1.16	27.0	1.09	18.2
8.....	1.50	77	1.30	44.0	1.06	16.6	1.25	38	1.18	29.0	1.08	16.0
9.....	2.00	188	1.30	44.0	1.11	21.0	1.25	38	1.10	20.0	1.10	13.5
10.....	1.70	116	1.14	24.0	1.11	21.0	1.26	39	1.15	26.0	1.05	12.8
11.....	1.80	140	1.14	24.0	1.10	20.0	1.25	38	1.10	20.0	1.00	12.0
12.....	1.70	116	1.14	24.0	1.06	16.6	1.26	39	1.07	17.4	1.00	11.5
13.....	1.70	116	1.14	24.0	1.11	21.0	1.25	38	1.15	26.0	0.95	11.0
14.....	1.50	77	1.14	24.0	1.11	21.0	1.25	38	1.20	31.0	0.95	10.2
15.....	1.50	77	1.14	24.0	1.11	21.0	1.25	38	1.18	29.0	0.95	9.7
16.....	1.50	77	1.14	24.0	1.11	21.0	1.20	31	1.15	26.0	0.95	8.9
17.....	1.50	77	1.14	24.0	1.11	21.0	1.20	31	1.10	20.0	0.95	8.0
18.....	1.57	90	1.07	17.4	1.16	27.0	1.20	31	1.15	26.0	0.95	7.9
19.....	1.57	90	1.06	16.6	1.16	27.0	1.20	31	1.14	24.0	0.93	8.7
20.....	1.56	88	1.06	16.6	1.16	27.0	1.20	31	1.15	26.0	0.90	10.2
21.....	1.56	88	1.05	15.8	1.16	27.0	1.19	30	1.10	20.0	0.89	11.5
22.....	1.50	77	1.05	15.8	1.16	27.0	1.18	29	1.15	26.0	0.88	12.1
23.....	1.45	68	1.05	15.8	1.14	24.0	1.16	27	1.15	26.0	0.90	12.0
24.....	1.45	68	1.04	14.9	1.11	21.0	1.15	26	1.15	26.0	0.93	11.7
25.....	1.44	66	1.00	11.5	1.14	24.0	1.14	24	1.15	26.0	0.93	11.2
26.....	1.41	66	0.95	7.8	1.14	24.0	1.12	22	1.10	20.0	0.95	10.9
27.....	1.45	68	1.00	11.5	1.12	22.0	1.10	20	1.05	15.8	0.93	10.2
28.....	1.40	59	1.00	11.5	1.10	20.0	1.11	21	0.90	4.0	0.92	9.9
29.....	1.50	77	1.00	11.5	1.14	24.0	1.15	26	1.00	11.5	0.91	9.5
30.....	1.45	68	1.00	11.5	1.12	22.0	1.12	22	1.00	11.5	0.95	9.0
31.....	1.45	68	0.99	10.8			1.10	20			0.93	8.5

a to a Ice conditions.

MONTHLY DISCHARGE of Swiftcurrent Creek near Swift Current (Lower Station), for 1915.

(Drainage area 1,000 square miles.)

MONTH.	DISCHARGE IN SECOND-FOOT.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total to Acre-foot.
January.....	9.1	3.1	5.2	0.003	0.006	179
February.....	3.3	3.0	3.1	0.00	0.00	172
March.....	670.0	3.5	118.0	0.118	0.146	2,299
April.....	988.0	61.0	231.0	0.341	0.288	7,743
May.....	137.0	49.0	72.0	0.072	0.081	4,427
June.....	159.0	35.0	73.0	0.073	0.081	4,344
July.....	188.0	59.0	85.0	0.085	0.098	5,297
August.....	63.0	7.8	20.0	0.026	0.020	1,099
September.....	27.0	10.8	21.0	0.021	0.021	1,250
October.....	40.0	20.0	31.0	0.031	0.046	1,466
November.....	31.0	4.0	22.0	0.022	0.004	1,077
December.....	18.2	7.0	11.5	0.012	0.013	707
The year.....					0.191	42,491



MISCELLANEOUS DISCHARGE MEASUREMENTS made in Swiftcurrent Creek drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Discharge.
				<i>Sec.-ft.</i>
July 5.....	J. E. Caughey.....	Hawkins Coulee.....	SE. 26-9-20-3.....	0.303 <i>c</i>
Aug. 19.....	do.....	do.....	do.....	0.273 <i>c</i>

*c* Weir measurement.

## ANTELOPE LAKE DRAINAGE BASIN.

### General Description.

Antelope Lake is a small body of saline water, six miles long and from one to one and one-half miles wide, situated at an elevation of 2,300 feet above sea level. It lies in a deep depression north of the main line of the Canadian Pacific Railway, in Township 15, Range 18, West of the 3rd Meridian, and drains an area of about 350 square miles.

The lake receives its supply from Bridge Creek, which rises in the Cypress Hills. The altitude of the source of this creek is 2,800 feet and it has an average fall of fifteen feet per mile.

The valley traversed by Bridge Creek is narrow and quite shallow, rarely exceeding 100 feet in depth. The land lying along the creek bottom is very flat and liable to become inundated during periods of flood. The bench land is rolling prairie, cut up by innumerable coulees which drain the surrounding country into the main valley.

The mean annual rainfall amounts to about fourteen inches, most of which occurs during May, June and July.

The creek has only a small flow, and is dry along most of its course for several months during the year.

### BRIDGE CREEK AT RAYMOND'S RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

*Records available.*—April 8, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. The elevation of the zero of the gauge has been maintained at 89.42 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made with meter at flood stages and with weir at ordinary stage.

*Winter flow.*—This station is not maintained during the winter.

*Observer.*—Mrs. C. Raymond.

### DISCHARGE MEASUREMENTS of Bridge Creek at Raymond's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 19.....	J. E. Caughey.....	4.0	1.90	0.06	2.19	1.14
Mar. 25.....	do.....	2.6	1.90	1.62	1.15	3.10
April 3.....	do.....	10.0	17.20	1.64	2.00	28.00
April 13.....	do.....	<i>a</i>			0.70	1.19
May 5.....	do.....				0.50	0.22
May 20.....	do.....				0.55	0.39
June 8.....	do.....				0.56	0.68
June 28.....	do.....				0.64	0.76
July 26.....	do.....				0.71	0.49
Aug. 17.....	do.....				0.64	0.22
Sept. 6.....	G. H. Whyte and J. E. Caughey.....				0.66	0.19
Sept. 20.....	J. E. Caughey.....				0.72	0.46
Oct. 9.....	do.....				0.74	0.50
Oct. 25.....	do.....	<i>a</i>			0.69	0.68

*a* to *a* Weir measurement.

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DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek at Raymond's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.35	20.00 <sup>a</sup>	0.46	0.13	0.75	1.60
2.....			2.65	35.00 <sup>a</sup>	0.46	0.13	1.00	4.80
3.....			2.00	28.00	0.51	0.25	1.10	6.50
4.....			1.40	12.70	0.45	0.11	1.08	6.10
5.....			1.25	9.40	0.50	0.22	1.13	7.00
6.....			0.90	3.30	0.53	0.32	0.80	2.10
7.....			0.98	4.50	0.51	0.25	0.54	0.34
8.....			0.95	4.00	0.53	0.32	0.58	0.50
9.....			0.92	3.60	0.46	0.13	0.59	0.54
10.....			0.90	3.30	0.49	0.20	0.63	0.74
11.....			0.92	3.60	0.51	0.25	0.68	1.05
12.....			0.85	2.60	0.50	0.22	0.65	0.84
13.....			0.70	1.19	0.65	0.84	0.60	0.55
14.....	2.22	1.00 <sup>a</sup>	0.78	1.90	0.90	3.30	0.65	0.84
15.....	2.31	1.05 <sup>a</sup>	0.75	1.60	1.60	17.50	0.60	0.58
16.....	2.32	1.10	0.73	1.44	1.20	8.40	0.56	0.42
17.....	2.82	1.12	0.70	1.19	1.03	5.30	0.59	0.54
18.....	2.32	1.13 <sup>a</sup>	0.68	1.05	0.90	3.30	0.63	0.74
19.....	2.12	1.14	0.63	0.74	0.83	2.40	0.85	2.60
20.....	2.37	1.20 <sup>a</sup>	0.68	1.05	0.55	0.38	0.73	1.44
21.....	2.54	2.00	0.65	0.84	0.58	0.50	0.70	1.19
22.....	2.87	2.50	0.59	0.54	0.53	0.32	0.75	1.60
23.....	2.22	2.70	0.55	0.38	0.51	0.25	0.78	1.90
24.....	1.93	3.00 <sup>a</sup>	0.53	0.32	0.58	0.50	0.70	1.19
25.....	1.14	3.10	0.50	0.22	1.80	22.70	0.85	2.60
26.....	1.10	3.00 <sup>a</sup>	0.47	0.15	1.28	10.10	0.80	2.10
27.....	1.05	4.00	0.45	0.11	0.83	2.40	0.75	1.60
28.....	1.10	5.00	0.53	0.32	0.58	0.50	0.70	0.76 <sup>b</sup>
29.....	0.98	5.00	0.48	0.20	0.65	0.84	0.78	1.80
30.....	1.06	8.00	0.46	0.13	0.75	1.60	0.75	1.51
31.....	1.01	12.00 <sup>a</sup>			0.70	1.19		

<sup>a</sup> Discharge estimated.  
<sup>b</sup> to <sup>b</sup> Shifting conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek at Raymond's Ranch, for 1915.—*Con.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.70	1.05	0.68	0.31	0.61	0.15	0.76	0.59
2.....	0.65	0.69	0.63	0.19	0.83	0.97	0.80	0.76
3.....	0.70	0.98	0.65	0.23	0.80	0.76	0.78	0.67
4.....	0.66	0.68	0.68	0.31	0.70	0.37	0.75	0.55
5.....	0.56	0.28	0.65	0.23	0.69	0.34	0.80	0.76
6.....	0.55	0.22	0.69	0.34	0.65	0.23	0.83	0.97
7.....	0.58	0.32	0.63	0.19	0.68	0.21	0.80	0.76
8.....	3.60	68.00	0.60	0.13	0.71	0.40	0.76	0.59
9.....	1.10	5.30	0.56	0.08	0.78	0.67	0.78	0.72b
10.....	0.80	1.35	0.54	0.06	0.80	0.76	0.80	0.83
11.....	0.77	1.05	0.56	0.08	0.78	0.67	0.77	0.68
12.....	0.70	0.61	0.54	0.06	0.78	0.67	0.73	0.52
13.....	0.75	0.84	0.58	0.10	0.83	0.97	0.75	0.63
14.....	0.85	1.60	0.63	0.19	0.80	0.76	0.74	0.67
15.....	0.70	0.56	0.56	0.08	0.78	0.67	0.73	0.72
16.....	0.75	0.81	0.54	0.06	0.80	0.76	0.66	0.52
17.....	0.80	1.05	0.64	0.21	0.82	0.90	0.65	0.55
18.....	0.75	0.58	0.59	0.12	0.80	0.76	0.68	0.72
19.....	0.70	0.42	0.56	0.08	0.88	1.40	0.66	0.67
20.....	0.65	0.24	0.60	0.13	0.80	0.76	0.67	0.76
21.....	0.60	0.11	0.65	0.23	0.69	0.34	0.69	0.97
22.....	0.55	0.05	0.69	0.34	0.73	0.48	0.68	0.97
23.....	0.75	0.56	0.61	0.15	0.75	0.55	0.65	0.83
24.....	0.78	0.68	0.69	0.34	0.70	0.37	0.63	0.76
25.....	0.73	0.46b	0.73	0.48	0.71	0.40	0.60	0.68
26.....	0.68	0.31	0.61	0.15	0.75	0.55	0.65	0.97
27.....	0.70	0.37	0.60	0.13	0.78	0.67	0.63	0.83
28.....	0.78	0.67	0.63	0.19	0.80	0.76	0.66	1.04
29.....	0.73	0.48	0.65	0.23	0.78	0.67	0.65	0.97
30.....	0.70	0.39	0.60	0.13	0.75	0.55	0.63	0.83
31.....	0.68	0.31	0.63	0.19			0.68	1.20b

b to b Shifting conditions.

## MONTHLY DISCHARGE of Bridge Creek at Raymond's Ranch, for 1915.

(Drainage area 6 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (14-31).....	12 00	1 00	3.220	0.537	0.36	115
April.....	35.00	0.11	4.770	0.793	0.88	281
May.....	22 70	9.11	2.740	0.457	0.53	168
June.....	7 00	0.34	1.870	0.311	0.35	111
July.....	98.00	0.05	2.940	0.490	0.56	181
August.....	0 48	0.06	0.184	0.031	0.04	11
September.....	1 10	0.15	0.620	0.103	0.12	37
October.....	1 20	0.52	0.770	0.129	0.15	47
The period.....					2.99	951

## SESSIONAL PAPER No. 25c

## DIMMOCK DITCH NEAR SKULL CREEK.

*Location.*—On SE.  $\frac{1}{4}$  Sec. 16, Tp. 11, Rge. 21, W. 3rd Mer., and is 250 feet northwest of the intake of the ditch and 400 feet southeast of the flume.

*Records available.*—Discharge measurements only 1912 to 1915.

*Gauge.*—Vertical staff graduated to feet and inches. Zero elevation maintained at 96.53 feet since establishment.

*Bench-mark.*—On the top of initial point of soundings, which is a 4-inch x 4-inch timber driven into the ground on the south side of the ditch. Assumed elevation, 100.00 feet.

*Channel.*—One channel at all stages. Clay bottom.

*Discharge measurements.*—Made with current-meter or weir.

*Observer.*—Dimmock Bros.

## DISCHARGE MEASUREMENTS of Dimmock Ditch near Skull Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 5.....	J. E. Caughey.....				0.50	0.08a
June 29.....	do.....				0.71	0.37a

a Weir measurement.

## BRIDGE CREEK AT GULL LAKE.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 23, Tp. 13, Rge. 19, W. 3rd Mer., at the highway bridge near the Canadian Pacific Railway station.

*Records available.*—March 29, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at 95.63 feet since establishment.

*Bench-mark.*—Permanent iron. Assumed elevation, 106.00 feet.

*Channel.*—Fairly permanent but may be affected by vegetation.

*Discharge measurements.*—With meter from bridge, or by wading or with weir.

*Winter flow.*—No winter observations have been taken.

*Observer.*—J. R. Gaskell.

## DISCHARGE MEASUREMENTS of Bridge Creek at Gull Lake, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 16.....	R. J. Strigley.....					Nil
Mar. 26.....	do.....	15 0	8 2	0 70	1 49	5 70
April 1.....	H. B. R. Thompson.....	10 6	7 0	0 05	0 97	0 33
April 9.....	do.....	10 5	7 1	0 08	0 84	0 58
April 17.....	do.....				0 48	0 04a
June 2.....	F. K. Beach.....				0 42	0 006
June 28.....	do.....				0 53	0 006
Aug. 6.....	do.....				0.75	Nil
Aug. 28.....	do.....				"	"
Sept. 28.....	do.....				"	"
Oct. 23.....	do.....				"	"

a Weir measurement.

b Slight flow, too small to measure

## DAILY GAUGE HEIGHT AND DISCHARGE of Bridge Creek at Gull Lake, for 1915.

DAY.	March.		April.		May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec. ft.
1.....			0.97	0.98		Nil.	0.43	Nil.	0.52	0.10
2.....			1.13	1.70		"	0.41	"	0.49	0.07
3.....			1.64	9.00		"	0.39	"	0.47	0.04
4.....			1.48	5.60		"	0.37	"	0.45	0.02
5.....			1.35	3.60		"		"	0.43	0.01
6.....			1.24	2.50		"		"	0.44	0.01
7.....			1.09	1.48		"		"	0.45	0.02
8.....			0.96	0.95		"		"	0.43	0.00
9.....			0.91	0.78		"		"	0.41	0.00
10.....			0.83	0.57		"		"	0.44	0.01
11.....			0.77	0.43		"		"	0.45	0.02
12.....			0.71	0.32		"		"	0.43	0.00
13.....			0.66	0.24		"		"	0.45	0.02
14.....			0.61	0.17		"		"	0.53	0.10
15.....			0.54	0.11		"		"	0.49	0.07
16.....			0.51	0.09	0.45	Nil.		"	0.51	0.09
17.....			0.47	0.04		"		"	0.51	0.09
18.....			0.45	Nil.		"		"	0.50	0.08
19.....			0.45	"		"		"	0.47	0.02
20.....				"		"		"	0.46	0.01
21.....				"		"		"	0.45	Nil.c
22.....	0.80	0.49a		"		"		"	0.44	
23.....	1.85	14.40		"		"		"	0.43	
24.....	3.15	68.00		"		"		"	0.43	
25.....	2.59	41.00		"		"		"	0.42	
26.....	1.95	17.30		"		"	0.15b		0.41	
27.....	1.70	10.40		"		"	0.05b		0.41	
28.....	1.31	3.10		"		"	0.43	Nil.	0.41	
29.....	1.18	2.00		"		"	0.41	"	0.40	
30.....	1.07	1.40		"	0.49	"	0.46	0.01	0.39	
31.....	1.01	1.12		"	0.47	"			0.39	

a Believed there was no previous discharge in March.

b No observation. Discharge estimated.

c Dry to October 31.

## MONTHLY DISCHARGE of Bridge Creek at Gull Lake, for 1915.

(Drainage area 231 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (22-31).....	68.00	0.00	5.10	0.02390	0.03	314
April.....	9.00	0.00	0.95	0.00442	0.01	57
May.....	0.00	0.00	0.00	0.00000	0.00	Nil.
June.....	0.15	0.00	0.01	0.00004	0.00	"
July.....	0.10	0.00	0.03	0.00014	0.00	2
August.....	0.00	0.00	0.00	0.00000	0.00	Nil.
September.....	0.60	0.00	0.00	0.00000	0.00	"
October.....	0.00	0.00	0.00	0.00000	0.00	"
The period.....					0.04	273

NOTE.—It is believed that the discharge here shown is the total discharge of the year.

## SPRING NO. 1 NEAR GULL LAKE.

Location.—On NW.  $\frac{1}{4}$  Sec. 32, Tp. 12, Rge. 18, W. 3rd Mer., in a deep coulee.

Records available.—March 13, to October 31, 1915. Discharge measurements only in 1914.

Gauge.—Vertical staff. Zero maintained at elevation of 89.36 feet since establishment.

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*Bench-mark.*—Wood post. Assumed elevation, 100.00 feet.

*Channel.*—Shifting.

*Discharge measurements.*—Using permanent one-foot weir.

*Observer.*—Percy C. Downey.

DISCHARGE MEASUREMENTS of Spring No. 1 near Gull Lake, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 11.	J. E. Caughey.					0.110 <sup>b</sup>
Feb. 16.	F. R. Steinberger.					..... <sup>a</sup>
Mar. 5.	do					..... <sup>a</sup>
April 9.	H. B. R. Thompson.				1.910	0.496 <sup>b</sup>
April 13.	do				2.500	0.240 <sup>b</sup>
April 16.	do				1.430	0.170 <sup>b</sup>
May 11.	G. H. Whyte.				1.295	0.090 <sup>b</sup>
June 2.	F. K. Beach.				1.360	0.197 <sup>b</sup>
June 28.	do				1.220	0.119 <sup>b</sup>
Aug. 6.	do				1.095	0.037 <sup>b</sup>
Aug. 28.	do				1.030	0.017 <sup>b</sup>
Sept. 28.	do				1.130	0.088 <sup>b</sup>
Oct. 22.	do				1.120	0.074 <sup>b</sup>

<sup>a</sup> Gauging impossible on account of ice conditions.

<sup>b</sup> Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Spring No. 1 near Gull Lake, for 1915.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			1.16	0.05	1.12	0.04	0.99	0.01		0.13
2.				0.08		0.04		0.01		0.15
3.				0.12		0.04		0.02	1.16	0.18
4.			1.22	0.16		0.04		0.02		0.17
5.				0.14		0.04	1.07	0.02		0.15
6.				0.12	1.10	0.04		0.02		0.14
7.				0.10		0.02		0.03	1.16	0.11
8.			1.20	0.09	0.99	0.01		0.04		0.10
9.				0.09		0.02	1.10	0.04		0.09
10.				0.09		0.03		0.05	1.14	0.09
11.			1.18	0.09		0.01		0.06		0.09
12.				0.09	1.08	0.05	1.15	0.07		0.09
13.				0.09		0.04		0.06		0.09
14.				0.09		0.03		0.06	1.14	0.09
15.			1.15	0.09	1.04	0.02	1.11	0.06		0.08
16.				0.10		0.02		0.06		0.08
17.				0.12		0.02		0.06	1.12	0.08
18.			1.24	0.14		0.02		0.06		0.08
19.				0.10	1.05	0.02	1.12	0.06		0.08
20.				0.07		0.02		0.06	1.14	0.09
21.				0.04		0.01		0.05		0.08
22.			1.06	0.01	1.04	0.01		0.04	1.12	0.07
23.	1.15	0.09		0.03		0.01		0.04		0.07
24.		0.09		0.04		0.01	1.00	0.04	1.12	0.07
25.		0.10	1.12	0.05		0.00		0.04		0.05
26.		0.13		0.07		0.00	1.02	0.04		0.04
27.	1.25	0.14		0.09	0.03	N.A.		0.06	1.08	0.03
28.	1.22	0.12	1.10	0.11	1.03	0.02	1.13	0.09		0.04
29.		0.09		0.10	0.97	0.00	1.14	0.09		0.04
30.		0.07		0.08		0.00		0.11		0.04
31.				0.06		0.00			1.11	0.05

NOTE.—On days where gauge height is shown, head on a one-foot weir was observed and used to compute discharge. Where no gauge height is shown discharge is estimated.

## MONTHLY DISCHARGE of Spring No. 1 near Gull Lake, for 1915.

(Drainage area 2.880 acres.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (13-31).....			1.17 <sup>a</sup>	0.2600	0.18	44
April.....			0.80 <sup>a</sup>	0.1780	0.20	48
May.....			0.13 <sup>a</sup>	0.0289	0.03	8
June.....			0.13 <sup>a</sup>	0.0289	0.03	8
July.....	0.16	0.01	0.09	0.0200	0.02	6
August.....	0.05	Nil.	0.02	0.0044	0.01	1
September.....	0.11	0.01	0.05	0.0111	0.01	3
October.....	0.18	0.03	0.09	0.0200	0.02	6
The period.....					0.50	124

<sup>a</sup> Mean discharge estimated by relation to discharge and drainage area of Spring No. 2.

## SPRING NO. 2 NEAR GULL LAKE.

*Location.*—On NE.  $\frac{1}{4}$  Sec. 27, Tp. 12, Rge. 19, W. 3rd Mer.*Records available.*—March 13 to October 31, 1915. Discharge measurements only in 1914.*Gauge.*—Vertical staff. Zero maintained at elevation of 91.38 feet since establishment.*Bench-mark.*—Boulder 50 feet east. Assumed elevation, 100.00 feet.*Channel.*—Shifting.*Discharge measurements.*—Using one-foot weir.*Observer.*—A. Gallagher.

## DISCHARGE MEASUREMENTS of Spring No. 2 near Gull Lake, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 11.....	J. E. Caughey.....					0.065 <sup>a</sup>
Mar. 6.....	F. R. Steinberger.....					0.078 <sup>a</sup>
Mar. 13.....	J. E. Caughey.....				1.36	0.094 <sup>a</sup>
Mar. 16.....	R. J. Strigley.....				1.76	0.328 <sup>a</sup>
Mar. 26.....	do.....				1.51	0.074 <sup>a</sup>
April 1.....	H. B. R. Thompson.....				1.82	0.300 <sup>a</sup>
April 9.....	do.....				1.59	0.079 <sup>a</sup>
April 13.....	do.....				1.58	0.120 <sup>a</sup>
April 17.....	do.....				1.57	0.170 <sup>a</sup>
May 11.....	G. H. Whyte.....				1.51	0.061 <sup>a</sup>
June 2.....	F. K. Beach.....				1.50	0.090 <sup>a</sup>
June 28.....	do.....				1.44	0.074 <sup>a</sup>
Aug. 6.....	do.....				1.36	0.048 <sup>a</sup>
Aug. 28.....	do.....				1.32	0.037 <sup>a</sup>
Sept. 28.....	do.....				1.38	0.077 <sup>a</sup>
Oct. 23.....	do.....				1.36	0.066 <sup>a</sup>

<sup>a</sup> Weir measurement.



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DAILY GAUGE HEIGHT AND DISCHARGE of Spring No. 2 near Gull Lake, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1			1.82	0.30	1.50	0.09	1.46	0.08
2			2.00	0.47	1.50	0.09	1.50	0.09
3			2.02	0.48	1.51	0.09	1.50	0.09
4			1.78	0.25	1.50	0.08		0.08
5			1.72	0.20	1.52	0.09	1.45	0.08
6			1.66	0.14	1.53	0.09		0.08
7			1.61	0.10	1.52	0.08	1.47	0.08
8			1.60	0.09	1.51	0.07		0.08
9			1.55	0.05	1.51	0.07	1.45	0.07
10			1.53	0.05	1.51	0.07		0.07
11			1.54	0.07	1.52	0.07	1.46	0.08
12			1.55	0.09	1.52	0.07		0.08
13	1.36	0.09	1.55	0.10	1.51	0.08	1.45	0.07
14	1.37	0.10	1.56	0.12		0.11		0.07
15	1.37	0.10	1.58	0.15	1.65	0.15	1.46	0.08
16	1.85	0.41	1.56	0.15	1.58	0.11		0.08
17	1.85	0.40	1.56	0.16	1.55	0.09	1.46	0.08
18	1.46	0.12	1.56	0.16	1.53	0.08		0.09
19	1.48	0.12	1.54	0.14	1.48	0.06	1.50	0.10
20	1.60	0.18	1.52	0.17	1.45	0.05		0.09
21	2.17	0.69	1.56	0.15	1.47	0.06	1.48	0.09
22	1.60	0.16	1.55	0.14	1.49	0.07		0.08
23	1.83	0.24	1.53	0.13	1.50	0.07	1.45	0.08
24	1.35	0.11	1.52	0.12	1.52	0.09		0.09
25	1.60	0.14	1.52	0.12	1.50	0.08	1.47	0.09
26	1.55	0.10	1.53	0.12	1.52	0.09		0.08
27	1.60	0.13	1.53	0.12	1.50	0.08	1.46	0.08
28	1.60	0.13	1.52	0.11	1.48	0.07	1.44	0.07
29	1.66	0.17	1.51	0.10	1.55	0.11	1.47	0.08
30	1.63	0.15	1.50	0.09	1.50	0.09		0.08
31	1.72	0.22			1.48	0.08		

a Observations discontinued.

MONTHLY DISCHARGE of Spring No. 2 near Gull Lake, for 1915.

(Drainage area 366 acres.)

MONTH.	DISCHARGE IN SECOND-FOOT.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total for Acre-foot.
March (13-31)	0.60	0.0	0.20	0.350	0.25	8
April..	0.48	0.05	0.15	0.262	0.20	9
May.	0.15	0.05	0.08	0.140	0.16	10
June	0.10	0.07	0.08	0.140	0.16	10
July..			0.09	0.158	0.18	10
August			0.04	0.070	0.08	10
September			0.04	0.070	0.08	10
October			0.08	0.140	0.16	10
The period					1.86	42

a Mean discharge estimated by relation to discharge at Spring No. 1.

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Antelope Lake drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Dis-charge.
June 28. . . .	F. K. Beach. . . .	Spring No. 1A. . . .	NE. 31-12-18-3. . . .	Weir. . . . .	. . . . .	. . . . .	0.0062
Aug. 6. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0076
Aug. 28. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0053
Sept. 28. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0107
Oct. 22. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0087
June 28. . . .	do . . . . .	Spring No. 1B. . . .	SW. 1-13-19-3. . . .	" . . . . .	. . . . .	. . . . .	0.1560
Aug. 6. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	Nil.
Aug. 28. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	"
Aug. 6. . . .	do . . . . .	C.P.R. Spring A. . . .	NW. 25-12-19-3. . . .	" . . . . .	. . . . .	. . . . .	0.0345
Aug. 6. . . .	do . . . . .	do B. . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0015
Aug. 28. . . .	do . . . . .	do A. . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0260
Aug. 28. . . .	do . . . . .	do B. . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0011
Sept. 28. . . .	do . . . . .	do A. . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0603
Sept. 28. . . .	do . . . . .	do B. . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0015
Oct. 22. . . .	do . . . . .	do A. . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0318
Oct. 22. . . .	do . . . . .	do B. . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0010
Jan. 11. . . .	J. E. Caughey. . . .	Spring No. 3. . . . .	SW. 27-12-19-3. . . .	" . . . . .	. . . . .	. . . . .	Nil.
Feb. 16. . . .	F. R. Steinbreger. . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	"
Mar. 5. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	"
April 9. . . .	H. B. R. Thompson . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.5150
April 13. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.1871
April 17. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0402
May 11. . . .	G. H. Whyte. . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0130
June 2. . . .	F. K. Beach. . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0470
June 28. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	0.0032
Aug. 6. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	Nil.
Aug. 28. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	"
Sept. 28. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	"
Oct. 23. . . .	do . . . . .	do . . . . .	do . . . . .	" . . . . .	. . . . .	. . . . .	"

## LAKE OF THE NARROWS DRAINAGE BASIN.

### General Description.

Lake of the Narrows is a small lake three miles long and one and one-half miles wide, in Township 3, Range 23, West of the 3rd Meridian. It has a drainage area of about 200 square miles.

The principal stream in the basin is Skull Creek, which rises in the eastern slope of Cypress Hills. It flows through a narrow valley for the greater part of its course, but as it nears the lake, the valley widens out into large meadows. The surrounding country is rolling prairie.

In very dry years such as 1910 and 1914 Skull Creek goes dry for a short time. The mean annual precipitation in the drainage basin is about thirteen inches.

### SKULL CREEK AT DOYLE'S RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 32, Tp. 10, Rge. 22, W. 3rd Mer., near Skull Creek Post Office. On September 1, 1915, the gauge was moved to this location from the NE.  $\frac{1}{4}$  Sec. 29, Tp. 10, Rge. 22, W. 3rd Mer., about one mile upstream.

*Records available.*—April 8, 1911, to October 31, 1915.

*Gauge.*—Vertical staff.

*Bench-marks.*—(1) A stump on the right bank about 50 feet south of the gauge. Elevation above the zero of the gauge 7.92 feet. (2) A stump on the right bank about 5 feet southeast of the gauge. Elevation 6.75 feet above the zero of the gauge.

*Discharge measurements.*—Made with the meter and with a weir at low stages.

*Winter flow.*—This stream is not maintained during winter.

*Observer.*—Thomas Doyle.

## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Skull Creek at Doyle's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 19.....	J. E. Caughey.....	7.5	2.90	1.16	2.03	3.40
Mar. 25.....	do.....	17.0	14.90	0.79	2.49	11.60
April 4.....	do.....	20.0	30.00	2.51	2.80	76.00
April 13.....	do.....	16.0	9.60	0.83	1.91	8.00
May 4.....	do.....	7.3	2.56	0.95	1.79	2.40
May 20.....	do.....	7.0	3.40	1.08	1.87	3.70
June 8.....	do.....	7.0	3.60	0.98	1.87	3.50
June 28.....	do.....	7.0	3.80	1.29	1.92	4.80
July 24.....	do.....	8.0	3.85	1.12	1.90	4.30
Aug. 16.....	do.....	5.7	1.65	0.55	1.71	0.90
Sept. 5.....	G. H. Whyte and J. E. Caughey.....	6.0	2.30	0.64	1.74	1.47
Sept. 20.....	J. E. Caughey.....	6.7	3.08	0.61	1.82	1.91
Oct. 8.....	do..... <sup>a</sup>	4.5	1.71	1.65	2.49	2.80
Oct. 23.....	do..... <sup>a</sup>	4.3	1.50	0.98	2.43	1.47

<sup>a</sup> New station one mile downstream.

## DAILY GAUGE HEIGHT AND DISCHARGE of Skull Creek at Doyle's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.19	28.00	1.63	0.18	1.95 <sup>a</sup>	6.0
2.....			3.19	40.00	1.63 <sup>a</sup>	0.18	1.95	6.0
3.....			3.23	80.00 <sup>b</sup>	1.63	0.18	1.95	6.0
4.....			2.87	76.00 <sup>c</sup>	1.79	1.86	1.95	6.0
5.....			2.67	61.00	1.79	1.86	1.92 <sup>a</sup>	4.9
6.....			2.65	59.00	1.76	1.44	1.90	4.2
7.....			2.60	54.00	1.79	1.86	1.87	3.5
8.....			2.53	47.00	1.78	1.72	1.89	4.0
9.....			2.30	26.00	1.75	1.30	1.90	4.2
10.....			2.15	15.50	1.75	1.30	1.92	4.9
11.....			1.98	7.10	1.75	1.30	1.92	4.9
12.....			1.94 <sup>a</sup>	5.60	1.75	1.30	1.94 <sup>a</sup>	5.6
13.....			1.91	4.60	1.75	1.30	1.95 <sup>a</sup>	6.0
14.....			1.85	3.10	2.10	12.50	1.96	6.4
15.....			1.85	3.10	2.33	29.00	1.90	4.2
16.....			1.79	1.86	2.12	13.70	1.87	3.5
17.....			1.79	1.86	1.98 <sup>a</sup>	7.10	1.88	3.3
18.....			1.76 <sup>a</sup>	1.44	1.85	3.10	1.90	4.2
19.....	2.03	3.4	1.74	1.16	1.87	3.50	2.05	10.2
20.....	1.90	3.36	1.74	1.16	1.87	3.50	1.98	7.1
21.....	2.29	5.0	1.72	0.88	1.86	3.30	1.96	6.4
22.....	2.38	6.0	1.71	0.74	1.85	3.10	1.95	6.0
23.....	2.44	8.0	1.71	0.74	1.85 <sup>a</sup>	3.10	1.96	6.4
24.....	2.39	10.00	1.69	0.54	1.86	3.30	1.97 <sup>a</sup>	6.7
25.....	2.44	11.60	1.68 <sup>a</sup>	0.48	1.95	6.00	1.99	7.4
26.....	2.68	18.00	1.68	0.48	2.25	22.00	2.25	22.0
27.....	2.37	24.0	1.66	0.36	1.93	5.30	1.98	7.1
28.....	2.32 <sup>a</sup>	30.0	1.64	0.24	1.94 <sup>a</sup>	5.60	1.98	7.1
29.....	2.27	36.0	1.64	0.24	1.95	6.00	1.92	4.9
30.....	1.95	20.0	1.63	0.18	1.95	6.00	1.98	7.1
31.....	1.89	20.0			1.95 <sup>a</sup>	6.00		

<sup>a</sup> Gauge height interpolated.<sup>b</sup> Discharge estimated.<sup>c</sup> Actual measurements.

DAILY GAUGE HEIGHT AND DISCHARGE OF Skull Creek at Doyle's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.90	4.2	1.87 <sub>a</sub>	3.50	2.32	0.65	2.55	4.00
2.....	1.95	6.0	1.87	3.50	2.32	0.65	2.52	3.40
3.....	1.93	5.3	1.85 <sub>a</sub>	3.10	2.35	1.04	2.65	6.20
4.....	1.93	5.3	1.85	3.10	2.35	1.04	2.60	5.00
5.....	1.91 <sub>a</sub>	4.6	1.85	3.10	2.36	1.15	2.55	4.00
6.....	1.90	4.2	1.85	3.10	2.36	1.15	2.58	4.60
7.....	1.87	3.6	1.84	2.90	2.36	1.15	2.57	4.40
8.....	2.06	10.6	1.85	3.10	2.36	1.15	2.45	2.30
9.....	1.98 <sub>a</sub>	7.1	1.85	3.10	2.36	1.15	2.49	2.90
10.....	1.90	4.2	1.82	2.40	2.36	1.15	2.49	2.90
11.....	1.85	3.1	1.75	1.30	2.36	1.15	2.48	2.70
12.....	1.90 <sub>a</sub>	4.2	1.75	1.30	2.35	1.04	2.45	2.30
13.....	1.95	6.0	1.73	1.02	2.37	1.26	2.44	2.10
14.....	2.02	8.7	1.73 <sub>a</sub>	1.02	2.37	1.26	2.44	2.10
15.....	1.95	6.0	1.73 <sub>a</sub>	1.02	2.37	1.26	2.42	1.87
16.....	1.94 <sub>a</sub>	5.6	1.72	0.88	2.37 <sub>a</sub>	1.26	2.42	1.87
17.....	1.92	4.9	1.71	0.74	2.37	1.26	2.42	1.87
18.....	1.92	4.9	1.71 <sub>a</sub>	0.74	2.37	1.26	2.42	1.87
19.....	1.92	4.9	1.71	0.74	2.45	2.30	2.42	1.87
20.....	1.87	3.5	1.71 <sub>a</sub>	0.74	2.60	5.00	2.42	1.87
21.....	1.87	3.5	1.71	0.74	2.37	1.26	2.43	2.00
22.....	1.88 <sub>a</sub>	3.8	1.71 <sub>a</sub>	0.74	2.37 <sub>a</sub>	1.26	2.42 <sub>a</sub>	1.87
23.....	1.89 <sub>a</sub>	4.0	1.72	0.88	2.37	1.26	2.42	1.87
24.....	1.90	4.2	1.73	1.02	2.37	1.26	2.42	1.87
25.....	1.90 <sub>a</sub>	4.2	1.72	0.88	2.40	1.60	2.42 <sub>a</sub>	1.87
26.....	1.90	4.2	1.71 <sub>a</sub>	0.74	2.45	2.30	2.42	1.87
27.....	1.90	4.2	1.70	0.60	2.48	2.70	2.42	1.87
28.....	1.95	6.0	2.30 <sub>b</sub>	0.56	2.50	3.10	2.42	1.87
29.....	1.90	4.2	2.31	0.61	2.50	3.10	2.43	2.00
30.....	1.87	3.5	2.31	0.61	2.45	2.30	2.43	2.00
31.....	1.87 <sub>a</sub>	3.5	2.31	0.61			2.43 <sub>c</sub>	2.00

*a* Gauge height interpolated.*b* to *c* New station.

## MONTHLY DISCHARGE OF Skull Creek at Doyle's Ranch, for 1915.

(Drainage area 19 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (19-31).....	36.0	3.30	15.00	0.789	0.38	387
April.....	80.0	0.18	17.40	0.916	1.02	1,035
May.....	29.0	0.18	5.10	0.268	0.31	314
June.....	22.0	3.50	6.20	0.326	0.36	369
July.....	10.6	3.50	4.90	0.258	0.30	301
August.....	3.5	0.56	1.55	0.082	0.09	95
September.....	5.0	0.65	1.57	0.083	0.09	93
October.....	6.2	1.87	2.60	0.137	0.16	160
The period.....					2.71	2,754

## SESSIONAL PAPER No. 25c

## MANN DITCH NEAR SKULL CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 32, Tp. 10, Rge. 22, W. 3rd Mer., about one mile from Skull Creek Post Office.

*Records available.*—July 1, 1913, to October 31, 1915. No water used previous to 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation 98.10 feet since establishment.

*Bench-mark.*—Wooden plug on right bank of ditch. Assumed elevation 100.00 feet.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—James Mann.

## DISCHARGE MEASUREMENTS of Mann Ditch near Skull Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
April 4.....	J. E. Caughey .....	3.2	3 84	0.50	1.28	3.08
April 13.....	do .....				0.38	0.20 <sup>a</sup>
July 23.....	do .....				Dry.	Nil.

*a* Estimated.

## DAILY GAUGE HEIGHT AND DISCHARGE of Mann Ditch near Skull Creek, for 1915.

DAY.	April.		May.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec. ft.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
1.....				
2.....	1 20 <sup>a</sup>	2 65		
3.....	1 20	2 65		
4.....	1 20	2 65		
5.....	1 20	2 65		
6.....	1 20	2 65		
7.....	1 20	2 65		
8.....	1 10	2 25		
9.....	1 00	1 85		
10.....	0 80	1 20		
11.....	0 70	0 90		
12.....	0 40	0 21		
13.....	0 38 <sup>b</sup>	0 18		
14.....				
15.....			0 90 <sup>a</sup>	1 50
16.....			0 60	0 64
17.....			0 50	0 46
18.....			0 20 <sup>b</sup>	
19.....				
20.....				
21.....				
22.....				
23.....				
24.....				
25.....				
26.....				
27.....				
28.....				
29.....				
30.....				
31.....				

*a* Headgates opened.

*b* Headgates closed.

## MONTHLY DISCHARGE of Mann Ditch near Skull Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (2-13) .....	2.65	0.18	1.87	44
May (15-18) .....	1.50	Nil.	0.63	5
The period. ....				49

## GORDON, IRONSIDES AND FARES DITCH NEAR PIAPOT.

*Location.*—On the N.W.  $\frac{1}{4}$  Sec. 7, Tp. 12, Rge. 22, W. 3rd Mer., about three miles southeast of Crane Lake station.

*Gauge.*—Vertical staff, situated on the right side of the ditch about 500 feet below the headgate. Zero elevation maintained at 94.01 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark; also used as initial point of soundings, on the left side of the ditch and 5.5 feet below the gauge. Assumed elevation, 100.00 feet.

*Channel.*—One channel, light sandy loam bed.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Gordon, Ironsides and Fares.

*Remarks.*—This station was established on June 14, 1915, by M. Gurofsky. One measurement was obtained by M. H. French on June 12, 1915.

## DISCHARGE MEASUREMENTS of Gordon, Ironsides and Fares Ditch near Piapot, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 12.....	M. H. French.....	6	3 14	0.76	0.77	2.4

## CRANE LAKE DRAINAGE BASIN

*General Description.*

Crane Lake is one of the largest of the lakes which receive their supply from the drainage of the northern slope of the Cypress Hills. It is situated in Township 13, Range 23, West of the 3rd Meridian and covers an area of some twenty-five square miles.

The lake has no outlet, is shallow, and the water is saline in character. It is fed by Piapot Creek, which rises in the Cypress Hills, flows northeastward, and is joined by Bear Creek in Section 7, Township 12, Range 22, West of the 3rd Meridian before it reaches the lake.

The country to the north of the lake is rolling and of little use for agriculture, being the eastern end of a range of sand hills which extend northwestward some forty miles. South of the lake the country is rolling prairie, which is bare of tree growth, except along the creeks where there is a small growth of willow and shrub. As it gets closer to the hills the country becomes more broken and the tree growth increases, making the ravines and coulees at the head of the creeks natural reservoirs which regulate the spring run-off considerably.

There are a number of irrigation schemes in operation and proposed, in this basin, also one or two industrial schemes along the main line of the Canadian Pacific Railway.

The mean annual precipitation of the northern part of the basin is about twelve inches, but in the hills this is exceeded. During the winter season from November to April, the streams are frozen over.

## BEAR CREEK AT UNSWORTH'S RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 18, Tp. 11, Rge. 23, W. 3rd Mer., at bridge about four miles from Piapot.

*Records available.*—June 22, 1908, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation has been maintained at 85.95 feet since establishment.

*Bench-mark.*—A circle of nails on the top of the stringer at the left abutment of the bridge on the downstream side. Assumed elevation, 100.00 feet.

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*Discharge measurements.*—Made with meter from the bridge; by wading or with a weir at low stages.

*Winter flow.*—This station is not maintained during winter.

*Observer.*—Miss A. Unsworth.

## DISCHARGE MEASUREMENTS of Bear Creek at Unsworth's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 24.....	J. E. Caughey.....	18.0	25.10	1.10	4.67	27.70
Mar. 26.....	do.....	19.0	22.80	0.70	3.55	15.90
April 2.....	do.....	30.0	51.00	0.63	4.01	32.50
April 4.....	do.....	37.4	220.70	1.53	11.42	338.00
April 10.....	do.....	28.0	43.10	0.90	3.24	38.00
April 12.....	do.....	25.0	29.80	0.98	2.83	28.00
April 13.....	do.....	26.0	30.20	0.90	2.80	28.00
May 1.....	do.....	9.0	13.15	0.79	1.79	10.40
May 21.....	do.....	8.5	16.40	1.04	2.14	17.10
May 31.....	do.....	8.5	13.00	0.98	1.87	12.80
June 5.....	do.....	15.0	23.40	1.18	3.14	28.00
June 26.....	do.....	14.0	18.40	1.12	2.65	21.00
July 22.....	do.....	11.5	11.77	0.56	1.60	6.60
Aug. 14.....	do.....	12.0	9.60	0.16	1.10	1.58
Sept. 4.....	G. H. Whyte and J. E. Caughey.....	17.0	19.50	0.22	1.47	4.20
Sept. 13.....	J. E. Caughey.....	17.0	19.75	0.24	1.57	4.90
Oct. 6.....	do.....	18.0	24.10	0.32	1.94	7.90
Oct. 21.....	do.....	18.0	22.00	0.29	1.80	6.60

## DAILY GAUGE HEIGHT AND DISCHARGE of Bear Creek at Unsworth's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.97	50.06	1.80	10.2	1.87	7.6
2.....			4.20	32.5a	1.80	10.2	2.60	18.6
3.....			7.82	180.05	1.80	10.2	2.86	23.3
4.....			11.40	338.0a	1.80	10.2	3.00	26.0
5.....			8.20	200.0	1.80	10.2	3.25	31.0
6.....			6.05	114.0	1.77	9.7	3.00	26.0
7.....			4.50	68.0	1.75	9.4	2.60	18.6
8.....			3.90	50.0	1.73	9.1	2.45	15.9
9.....			3.50	42.0	1.70	8.6	2.30	13.4
10.....			3.25	37.0	1.70	8.6	2.10	10.4
11.....			3.00	32.0	1.67	8.2	2.25	12.6
12.....			2.83	29.0	1.65	7.9	2.70	13.4
13.....			2.90	30.0	1.65	7.9	2.25	12.6
14.....			2.83	29.0	2.20	17.0	2.20	11.9
15.....			2.63	25.0	3.05	33.0	2.15	11.2
16.....			2.60	24.0	4.95	32.0	2.17	11.4
17.....			2.41	21.0	3.47	41.0	2.00	9.2
18.....			2.43	21.0	2.80	38.0	1.95	8.6
19.....			2.30	18.6	2.47	22.0	2.10	10.4
20.....	2.00	6.00b	2.27	18.3	2.40	21.0	1.80	24.0
21.....	3.08	6.00b	2.23	17.5	2.35	17.9	2.00	18.6
22.....	3.67	8.00b	2.17	16.5	2.00	13.5	2.57	18.1
23.....	4.38	20.00b	2.14	15.9	1.87	13.0	2.54	17.7
24.....	4.65	27.70b	2.10	15.2	1.90	11.8	2.55	17.8
25.....	4.40	20.00b	2.03	11.0	2.06	13.5	2.00	10.7
26.....	3.70	15.90a	2.01	13.7	2.10	15.7	2.00	18.6
27.....	3.65	16.00b	2.00	11.5	2.70	26.0	2.65	19.5
28.....	3.45	20.00b	1.97	13.0	2.45	27.0	2.00	13.4
29.....	2.80	28.00b	1.95	12.6	2.70	15.2	2.75	13.6
30.....	2.75	26.00b	1.83	10.7	2.00	13.5	2.00	11.9
31.....	3.40	32.00b			1.87	11.4		

a Actual measurements.

b Discharge estimated.



DAILY GAUGE HEIGHT AND DISCHARGE of Bear Creek at Unsworth's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.15	11.2	1.60	4.80	1.20	1.90	1.90	8.0
2.....	2.10	10.4	1.55	4.40	1.25	2.20	1.90	8.0
3.....	2.00	9.2	1.45	3.60	1.37	3.10	2.10	10.4
4.....	1.97	8.8	1.35	3.00	1.40	3.30	2.00	9.2
5.....	1.87	7.6	1.27	2.40	1.40	3.30	2.10	10.4
6.....	1.80	6.8	1.25	2.20	1.40	3.30	2.15	11.2
7.....	2.05	9.8	1.25	2.20	1.37	3.10	2.12	10.7
8.....	2.20	11.9	1.13	1.41	1.45	3.60	2.10	10.4
9.....	2.55	17.7	1.10	1.20	1.57	4.60	2.10	10.4
10.....	2.45	15.9	1.05	0.90	1.50	4.00	2.25	12.6
11.....	1.95	8.6	1.05	0.90	1.47	3.80	2.30	13.4
12.....	1.80	6.8	1.03	0.78	1.55	4.40	2.20	11.9
13.....	1.90	8.0	1.00	0.60	1.65	5.30	2.15	11.2
14.....	2.10	10.4	1.10	1.20	1.65	5.30	2.15	11.2
15.....	2.00	9.2	1.80	6.80	1.65	5.30	2.10	10.4
16.....	2.05	9.8	1.70	5.80	1.63	5.10	2.00	9.2
17.....	2.00	9.2	1.55	4.40	1.60	4.80	1.95	8.6
18.....	2.00	9.2	1.25	2.20	1.57	4.60	1.90	8.0
19.....	1.95	8.6	1.03	0.78	1.65	5.30	1.90	8.0
20.....	1.80	6.8	1.10	1.20	1.80	6.80	1.95	8.6
21.....	1.75	6.3	1.25	2.20	1.82	7.00	1.80	6.8
22.....	1.60	4.8	1.30	2.60	1.80	6.80	2.00	9.2
23.....	2.20	11.9	1.25	2.20	1.78	6.60	2.00	9.2
24.....	2.35	14.2	1.20	1.90	1.78	6.60	2.00	9.2
25.....	2.30	13.4	1.15	1.55	1.75	6.30	2.05	9.8
26.....	2.15	11.2	1.12	1.34	1.75	6.30	2.05	9.8
27.....	2.05	9.8	1.20	1.90	1.75	6.30	2.00	9.2
28.....	1.95	8.6	1.30	2.60	1.75	6.30	2.00	9.2
29.....	1.80	6.8	1.27	2.40	1.80	6.80	1.97	8.8
30.....	1.77	6.5	1.23	2.10	1.85	7.40	1.95	8.6
31.....	1.65	5.3	1.20	1.90			2.00	9.2

## MONTHLY DISCHARGE of Bear Creek at Unsworth's Ranch, for 1915.

(Drainage area 100 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (20-31).....	32.0	6.00	18.9	0.189	0.08	450
April.....	338.0	10.70	50.0	0.500	0.56	2,975
May.....	41.0	7.90	15.7	0.157	0.18	965
June.....	31.0	7.60	16.0	0.160	0.18	952
July.....	17.7	5.30	9.5	0.095	0.11	584
August.....	6.8	0.60	2.4	0.024	0.03	148
September.....	7.4	1.90	5.0	0.050	0.06	298
October.....	13.4	6.80	9.7	0.097	0.11	596
The period.....					1.31	6,968

## SESSIONAL PAPER No. 25c

## NEEDHAM BROTHERS DITCH FROM BEAR CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer., about two miles south of Pispat.

*Records available.*—Discharge measurements only from 1911 to 1914 and complete records during the irrigation season of 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 88.63 feet since establishment.

*Bench-mark.*—A broad arrow cut in the top of the right hand support of the bridge on the downstream side. Assumed elevation, 100.00 feet.

*Channel.*—One channel at all stages.

*Discharge measurements.*—Made with a weir or current-meter.

*Observer.*—Miss M. Fauquier.

## DISCHARGE MEASUREMENTS of Needham Brothers Ditch from Bear Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 1. ....	J. E. Caughey. ....	7.0	6.7	1.34	1.91	9.01
June 25. ....	do. ....					Dry.

## DAILY GAUGE HEIGHT AND DISCHARGE of Needham Brothers Ditch from Bear Creek, for 1915.

DAY.	April.		May.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1..			2.08	12.6
2..			2.08	12.6
3..			2.00	11.0
4..			2.00	11.0
5..			2.00	11.0
6..				
7..			2.08	12.6
8..			2.08	12.6
9..			2.00	11.0
10..				
11..				
12..				
13..				
14..				
15..				
16..				
17..				
18..				
19..				
20..				
21..				
22..				
23..				
24..				
25..				
26..				
27..				
28..	1.75	6.3		
29..	2.00	11.0		
30..	2.00	11.0		
31..				

## MONTHLY DISCHARGE of Needham Brothers Ditch from Bear Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (28-30).....	11.0	6.3	9.4	56
May (1-8).....	12.6	11.0	11.8	187
The period.....				243

## BRANIFF DITCH FROM BEAR CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer.

*Records available.*—One discharge measurement in 1914. No discharge recorded in 1915.

*Gauge.*—Vertical staff, at headgate. Elevation of zero 95.91 feet.

*Bench-mark.*—Stump on right bank. Assumed elevation, 100.00 feet.

*Discharge measurements.*—Made by wading.

*Observer.*—No observations in 1915.

## MCCARTHY, BERTRAM AND SALT WEST DITCH FROM BEAR CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 29, Tp. 11, Rge. 23, W. 3rd Mer., about three hundred feet down-stream from the dam.

*Records available.*—Discharge measurements only in 1914. Records for irrigation season of 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 96.84 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Clay with a growth of vegetation.

*Discharge measurements.*—Made with current-meter or weir.

*Observer.*—W. Salt.

## DISCHARGE MEASUREMENTS of McCarthy, Bertram and Salt West Ditch from Bear Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 12.....	J. E. Caughey.....	8.0	11.65	1.07	2.09	12.4
May 31.....	do.....					Dry.
June 26.....	do.....					

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DAILY GAUGE HEIGHT AND DISCHARGE of McCarthy, Bertram and Salt West Ditch from Bear Creek, for 1915.

DAY.	April.	
	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		
2.....		
3.....		
4.....		
5.....		
6.....		
7.....	1.80 <sup>a</sup>	8.0
8.....	1.85	8.7
9.....	2.00	10.9
10.....	2.09	12.3
11.....	2.09	12.3
12.....	2.09	12.3
13.....	2.00	10.9
14.....	1.59	9.2
15.....	1.79	7.9
16.....	1.59	5.5
17.....	1.59	5.5
18.....	1.59	5.5
19.....	1.59	5.5
20.....	1.59	5.5
21.....	1.59	5.5
22.....	1.59 <sup>b</sup>	5.5
23.....		
24.....		
25.....		
26.....		
27.....		
28.....		
29.....		
30.....		
31.....		

<sup>a</sup> Ditch turned on.<sup>b</sup> Ditch turned off.

## MONTHLY DISCHARGE of McCarthy, Bertram and Salt West Ditch from Bear Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre feet.
	Maximum.	Minimum.	Mean.	
April (7-22).....	12.3	5.5	8.2	260
The period.....				260

## MCCARTHY, BERTRAM AND SALT EAST DITCH FROM BEAR CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 29, Tp. 11, Rge. 23, W. 3rd Mer., near Piapot and 300 feet northeast of dam and 75 feet below headgate.

*Records available.*—For irrigation season of 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 97.73 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark near the dam. Assumed elevation, 100.00 feet.

*Channel.*—Clay, with a heavy growth of vegetation.

*Discharge measurements.*—Made with current-meter or weir.

*Observer.*—W. Salt.

## DISCHARGE MEASUREMENTS of McCarthy, Bertram and Salt East Ditch from Bear Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 12.....	J. E. Caughey.....	11.0	21.15	0.61	2.91	13.00
May 31.....	do.....				0.58	Nil. <sup>a</sup>
June 26.....	do.....					Dry.

<sup>a</sup> Water standing in pools.

## DAILY GAUGE HEIGHT AND DISCHARGE of McCarthy, Bertram and Salt East Ditch from Bear Creek, for 1915.

DAY.	April.	
	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		
2.....		
3.....		
4.....		
5.....		
6.....		
7.....	1.62 <sup>a</sup>	3.9
8.....	2.80	12.0
9.....	2.82	12.2
10.....	2.80	12.0
11.....	2.90	13.0
12.....	2.91	13.1
13.....	2.90	13.0
14.....	2.92	12.2
15.....	2.80	12.0
16.....	2.72	11.3
17.....	3.22	16.2
18.....	3.22	16.2
19.....	3.20	16.0
20.....	3.10	15.0
21.....	2.96	13.6
22.....	2.90 <sup>b</sup>	13.0
23.....		
24.....		
25.....		
26.....		
27.....		
28.....		
29.....		
30.....		
31.....		

<sup>a</sup> Ditch turned on.<sup>b</sup> Ditch turned off.

## MONTHLY DISCHARGE of McCarthy, Bertram and Salt East Ditch from Bear Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (7-22) .....	16.2	3.9	12.9	409
The period.....				409

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## TRANTER SOUTH DITCH NEAR MAPLE CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 5, Tp. 10, Rge. 24, W. 3rd Mer.

*Gauge.*—Vertical staff, located 450 feet below headgate on the left side of the ditch. Zero elevation maintained at 97.22 feet since establishment.

*Bench-mark.*—A wooden plug surrounded by stones on right bank of ditch, four feet upstream from gauge. Assumed elevation, 100.00 feet.

*Channel.*—One at all stages, gravel bed.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—G. Tranter.

*Remarks.*—This station was established on May 20, 1915, by R. B. Williamson, but no records were obtained in 1915.

## TRANTER NORTH DITCH NEAR MAPLE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 18, Tp. 10, Rge. 24, W. 3rd Mer.

*Gauge.*—Vertical staff, located 800 feet below the headgate, on left side of ditch. Zero elevation maintained at 98.88 feet since establishment.

*Bench-mark.*—A six-inch log surrounded by stones on right side of ditch and five feet upstream from gauge. Assumed elevation, 100.00 feet.

*Channel.*—One at all stages. Bed clean.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—G. Tranter.

*Remarks.*—This station was established on May 20, 1915, by R. B. Williamson, but no records were obtained in 1915.

## BEVERIDGE WEST DITCH FROM PIAPOT CREEK.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 18, Tp. 10, Rge. 24, W. 3rd Mer., about 350 feet below point of intake.

*Records available.*—Irrigation seasons June, 5, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 97.82 feet during 1915.

*Bench-mark.*—Top of wooden post used as I. P. Assumed elevation, 100.00 feet.

*Channel.*—Clay and gravel, permanent.

*Control.*—A permanent control has been placed on this ditch below the gauge.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—D. Beveridge.

## DISCHARGE MEASUREMENTS of Beveridge West Ditch from Piapot Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. Ft.	Ft. per sec.	Feet.	Sec. ft.
May 4	J. E. Caughey					Nil
May 20	do	4 0	1 43	0 48	0 66	0 60
May 29	do				0 54	0 33
June 25	do					Nil

## DAILY GAUGE HEIGHT AND DISCHARGE of Beveridge West Ditch from Piapot Creek, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1					0.90 <sup>a</sup>	1.85
3					0.90 <sup>c</sup>	1.85
3					0.90 <sup>c</sup>	1.85
4					0.90 <sup>c</sup>	1.85
5	0.90 <sup>a</sup>	1.85			0.90	1.85
6	0.90	1.85			0.85	1.58
7	0.90 <sup>c</sup>	1.85			0.80	1.30
8	0.90	1.85			0.80	1.30
9	0.90	1.85			0.80	1.30
10	0.90 <sup>b</sup>	1.85			0.80	1.30
11					0.80	1.30
12					0.80	1.30
13					0.80	1.30
14					0.80	1.30
15					0.80	1.30
16					0.80	1.30
17					0.80	1.30
18			1.20 <sup>a</sup>	3.60	0.80	1.30
19			1.10	3.00	0.80	1.30
20			0.70	0.84		
21			0.70	0.84		
22			0.60	0.50		
23			0.70 <sup>c</sup>	0.84		
24			0.80	1.30		
25			0.80	1.30		
26			0.80	1.30		
27			0.70	0.84		
28			0.60 <sup>c</sup>	0.50		
29			0.54 <sup>b</sup>	0.37		
30						
31						

<sup>a</sup> Headgates opened.<sup>b</sup> Headgates closed.<sup>c</sup> Gauge height interpolated.

## MONTHLY DISCHARGE of Beveridge West Ditch from Piapot Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (5-10)	1.85	1.85	1.85	22
May (18-29)	3.60	0.37	1.27	30
June (1-13)	1.85	1.30	1.46	55
The period				107

## MOORHEAD DITCH FROM PIAPOT CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 25, Tp. 10, Rge. 25, W. 3rd Mer., near the centre of the quarter-section and about 400 feet from the intake of the ditch.

*Records available.*—Discharge measurements only 1912-14. Records for irrigation season of 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 95.42 feet since establishment.

*Bench-mark.*—On a three-inch post, used as Initial Point driven into ground about one foot from gauge and surrounded by small stones. Assumed elevation, 100.00 feet.

*Channel.*—One permanent channel. Bed consists of small rocks of about two inches in diameter.

*Discharge measurements.*—Made with current-meter or weir.

*Observer.*—H. Moorhead.



## SESSIONAL PAPER No. 25c

## DISCHARGE MEASUREMENTS of Moorhead's Ditch from Piapot Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 21.....	M. H. French.....	6.5	3.63	0.69	1.01	2.6
June 25.....	J. E. Caughey.....	5.6	2.63	0.99	1.01	2.6
July 22.....	do.....					Nil.
Aug. 14.....	do.....					

## DAILY GAUGE HEIGHT AND DISCHARGE of Moorhead's Ditch from Piapot Creek, for 1915.

DAY.	May.		June.		July.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.25	4.9	1.20	4.4	1.16	4.0
2.....	1.24 <sup>a</sup>	4.8	1.25	4.9	1.18	4.2
3.....	1.24	4.8	1.30	5.4	1.18	4.2
4.....	1.22	4.6	1.35	6.0	1.18	4.2
5.....	1.19	4.3	1.35	6.0	1.19	4.3
6.....	1.18	4.2	1.40	6.6	1.19	4.3
7.....	1.17 <sup>a</sup>	4.1	1.40 <sup>e</sup>	6.6	1.19	4.3
8.....	1.15	3.9	1.40	6.6	1.20	4.4
9.....	1.15 <sup>b</sup>	3.9	1.40 <sup>f</sup>	6.6	1.20 <sup>k</sup>	4.4
10.....	1.16	4.0	1.40	6.6	1.23	4.4
11.....	1.16	4.0	1.38	6.4	1.19	4.3
12.....	1.17	4.1	1.38	6.4	1.19	4.3
13.....	1.18	4.2	1.36	6.1	1.19	4.3
14.....	1.19 <sup>b</sup>	4.3	1.33	5.8	1.19	4.3
15.....	2.00	15.9	1.33	5.8	1.19	4.3
16.....	2.00 <sup>c</sup>	15.9	1.30	5.4	1.19	4.3
17.....	1.90	14.3	1.27	5.1	1.19	4.3
18.....	1.80	12.7	1.24	4.8	1.19	4.3
19.....	1.60	9.5	1.21	4.5	1.19	4.3
20.....	1.40	6.6	1.17	4.1	1.19	4.3
21.....	1.30 <sup>c</sup>	5.4	1.14	3.8	1.19	4.3
22.....	1.20	4.4	1.10	3.4	1.19	4.3
23.....	1.20 <sup>d</sup>	4.4	1.06	3.0	1.19	4.3
24.....	1.20	4.4	1.03 <sup>f</sup>	2.8	1.19	4.3
25.....	1.19	4.3	1.01	2.6	1.19	4.3
26.....	1.18	4.2	1.04 <sup>h</sup>	2.8	1.19	4.3
27.....	1.16	4.0	1.06	3.0	1.19	4.3
28.....	1.12 <sup>i</sup>	3.6	1.08 <sup>h</sup>	3.2	1.19	4.3
29.....	1.10	3.4	1.10	3.4	1.19	4.3
30.....	1.10 <sup>e</sup>	3.4	1.12 <sup>k</sup>	3.6	1.19	4.3
31.....	1.15	3.9			1.19	4.3

a-a; h-h; c-c; d-d; e-e; f-f; h-h; k-k Gauge heights interpolated.

i Headgate closed.

## MONTHLY DISCHARGE of Moorhead's Ditch from Piapot Creek, for 1915.

MONTH.	DISCHARGE IN SECONTE-FOOT.			Total discharge in Acre-feet
	Maximum	Minimum.	Mean.	
May.....	15.9	3.4	5.8	357
June.....	6.6	2.6	4.9	292
July (1-10).....	4.4	4.0	4.3	85
The period.....				734

## FEARON DITCH NEAR PIAPOT.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 6, Tp. 11, Rge. 24, W. 3rd Mer., about 1,000 feet from the point of intake.

*Records available.*—Discharge measurements taken during the irrigation seasons of 1914 and 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 97.41 feet since establishment.

*Bench-mark.*—Top of post used as I. P. Assumed elevation, 100.00 feet.

*Channel.*—Clay, covered with grass.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Ed. Fearon.

## DISCHARGE MEASUREMENTS of Fearon Ditch near Piapot, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 14.....	J. E. Caughey.....					Dry.
May 29.....	do.....				0.59	0.18 <sup>a</sup>
June 25.....	do.....				0.79	0.24 <sup>a</sup>
July 22.....	do.....				0.58	Nil. <sup>a</sup>

<sup>a</sup> Weir measurement.

## CUMBERLAND DITCH FROM PIAPOT CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 17, Tp. 11, Rge. 24, W. 3rd Mer., about 300 feet from the head-gate of the ditch.

*Records available.*—June 27, 1914, to October 31, 1915. No water used in 1914.

*Gauge.*—Vertical staff. Zero maintained at 98.00 feet since establishment.

*Bench-mark.*—Wooden stake used for I. P. Assumed elevation, 100.00 feet.

*Channel.*—Clay, fairly permanent.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Andrew Cumberland.

## DISCHARGE MEASUREMENTS of Cumberland Ditch from Piapot Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 14.....	J. E. Caughey.....					Nil.
May 15.....	M. H. French.....	5.0	3.21	0.92	0.90	2.94
May 18.....	do.....	5.0	2.64	0.69	0.75	1.83
May 18.....	do.....	5.0	2.25	0.64	0.66	1.44
May 18.....	do.....				0.22	..... <sup>a</sup>
May 28.....	J. E. Caughey.....	3.5	2.07	0.64	0.62	1.34
June 24.....	do.....					Nil.

<sup>a</sup> Slight seepage only.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Cumberland Ditch from Piapot Creek, for 1915.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			1.50	9.0
2.			1.20	5.6
3.			1.15c	5.1
4.			1.10c	4.6
5.			1.05c	4.2
6.			1.00	3.7
7.			0.95c	3.3
8.			0.85b	2.6
9.	0.60a	1.18		
10.	0.57c	1.07		
11.	0.55	0.99		
12.	0.58c	1.10		
13.	0.50	1.18		
14.	0.90	2.90		
15.	1.20	5.60		
16.	1.30	6.70		
17.	1.10	4.69		
18.	0.80	2.20		
19.	0.70	1.64		
20.	0.68c	1.55		
21.	0.66c	1.46		
22.	0.65	1.41		
23.	0.65	1.41		
24.	0.75c	1.93		
25.	0.90c	2.90		
26.	1.09	3.70		
27.	0.60	1.18		
28.	0.62	1.27		
29.	0.80c	2.20		
30.	1.00c	3.70		
31.	1.25c	6.20		

a Headgates opened.

b Headgates closed.

c Gauge height interpolated.

## MONTHLY DISCHARGE of Cumberland Ditch from Piapot Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet
	Maximum.	Minimum.	Mean.	
May (9-31)	6.7	0.99	2.5	114
June (1-8)	9.0	2.60	4.8	76
The period				190

## PIAPOT CREEK AT CUMBERLAND'S RANCH

*Location.* On the NE  $\frac{1}{4}$  Sec. 18, Tp. 11, Rge. 21, W. 3rd Mer.*Records available.*—May 13, 1909, to October 31, 1915; from July 1, 1908, to May 12, 1909, records on this creek were obtained at a station three-quarters of a mile upstream from the present gauge.*Gauge.*—Vertical staff. Zero maintained at elevation of 89.75 feet during 1909-11 and at 88.75 feet during 1912-15.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Discharge measurements.*—Made with weir at low stages and with meter at ordinary stages.*Winter flow.*—This station is not maintained during the winter.*Artificial control.*—A log buried in the bed of the stream about forty feet below the gauge forms a control at this station.*Diversions.*—Messrs. Fearon and Moorhead, D. Beveridge, Geo. Tranter and A. Cumberland divert water for irrigation purposes, above this station.*Observer.*—A. Cumberland.

## DISCHARGE MEASUREMENTS of Piapot Creek at Cumberland's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 23.....	J. E. Caughey.....	9.0	3.35	4.43	4.79	14.80
Mar. 27.....	do.....	9.0	2.30	3.84	4.2 <sup>a</sup>	8.80
Aprl 2.....	do.....	14.0	16.25	0.57	2.00	9.30
Aprl 5.....	do.....	14.0	16.20	1.22	2.05	19.80
Aprl 10.....	do.....	13.0	10.15	0.96	1.57	9.80
Aprl 11.....	do.....	12.0	8.80	0.98	1.52	8.60
Aprl 12.....	do.....	12.0	8.80	0.90	1.57	8.00
Aprl 14.....	do.....	12.0	9.20	0.95	1.51	7.80
May 1.....	do.....	<i>a</i>			1.03	0.13
May 21.....	do.....				1.08	0.57
May 28.....	do.....	<i>b</i>			1.0 <sup>a</sup>	0.57
June 24.....	do.....	9.3	4.80	0.97	1.36	4.70
July 21.....	do.....	11.2	7.81	0.71	1.61	5.60
Aug. 13.....	do.....	11.5	5.95	0.50	1.70	3.00
Sept. 3.....	G. H. Whyte and J. E. Caughey.....	14.6	7.21	0.51	1.64	3.70
Sent. 17.....	J. E. Caughey.....	11.0	5.30	0.43	1.34	2.30
Oct. 4.....	do.....	12.0	6.80	0.76	1.45	5.20
Oct. 21.....	do.....	12.0	6.35	0.50	1.32	3.20

*a-b* Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Piapot Creek at Cumberland's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.35	8.00 <sup>c</sup>	0.91	0.11	2.72	74.00
2.....			2.60	9.30	1.03	0.32	1.77	21.00
3.....			2.95	12.00 <sup>c</sup>	1.02	0.28	1.40	4.10
4.....			3.09	16.00 <sup>c</sup>	1.10	0.60	1.40	4.10
5.....			2.20	19.80	1.15	0.95	1.37	3.60
6.....			1.99	18.00 <sup>c</sup>	1.14	0.88	1.32	2.80
7.....			1.70	16.00 <sup>c</sup>	1.10	0.60	1.15	0.95
8.....			2.70	13.00 <sup>c</sup>	1.10	0.60	1.19	1.23
9.....			1.93	12.00 <sup>c</sup>	1.15	0.95	1.22	1.54
10.....			1.57	9.80	1.15	0.95	1.22	1.54
11.....			1.53 <sup>a</sup>	8.40	1.10	0.60	1.60	12.00
12.....			1.50	6.80	1.07	0.48	1.50	6.80
13.....			1.53	8.40	1.14	0.88	1.47	6.00
14.....			1.51	7.30	1.23	1.66	1.46	5.70
15.....	5.19	5.0 <sup>c</sup>	1.50	6.80	1.62	13.10	1.40	4.10
16.....	5.40	6.0 <sup>c</sup>	1.42	4.60	1.88	27.00	1.35	3.30
17.....	5.30	7.0 <sup>c</sup>	1.35	3.30	1.33	3.00	1.32	2.80
18.....	5.26	8.0 <sup>c</sup>	1.31	2.70	1.14	0.88	1.30	2.50
19.....	5.08	9.0 <sup>c</sup>	1.26	2.00	1.04	0.36	1.65	14.80
20.....	5.07	10.0 <sup>c</sup>	1.22	1.54	1.04	0.36	2.00	34.00
21.....	5.10	11.0 <sup>c</sup>	1.19	1.23	1.08	0.52	1.55	9.40
22.....	5.07	13.0 <sup>c</sup>	1.48	1.16	1.08	0.52	1.46	5.70
23.....	4.87	14.8	1.18	1.16	1.06	0.44	1.41	4.40
24.....	4.73	12.0 <sup>c</sup>	1.17	1.09	1.07	0.48	1.37	3.60
25.....	4.90 <sup>a</sup>	15.0	1.17	1.09	1.07	0.48	1.28	2.30
26.....	5.07	12.0 <sup>c</sup>	1.16	1.02	1.24	1.78	1.67	15.80
27.....	4.42	8.8	1.16	1.02	1.10	0.60	1.58 <sup>d</sup>	10.40
28.....	4.59	8.0 <sup>c</sup>	1.16	1.02	1.08	0.52	1.50	6.30
29.....	4.34	7.5 <sup>c</sup>	1.15	0.95	1.15 <sup>a</sup>	0.95	1.50	6.00
30.....	3.59	7.8 <sup>c</sup>	1.01	0.24	1.30 <sup>a</sup>	2.50	1.55	7.30
31.....	3.28	7.0 <sup>c</sup>			1.50 <sup>a</sup>	6.80		

*a* Interpolated gauge heights.*c* Discharge estimated. Ice conditions*d-e* Shifting conditions.

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DAILY GAUGE HEIGHT AND DISCHARGE of Piapot Creek at Cumberland's Ranch for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.60	9.40	1.70	5.70	1.50	1.90	1.29	2.40
2.....	1.30	2.40	1.65	4.10	1.54	2.40	1.30	2.50
3.....	1.35	2.30	1.60	3.10	1.63	3.80	1.45	4.40
4.....	1.30	1.54	1.58	2.70	1.60	3.50	1.47	6.00
5.....	1.30	1.54	1.57	2.10	1.57	3.30	1.29	3.90
6.....	1.29	1.42	1.57	1.78	1.45	1.90	1.47	6.00
7.....	1.49	4.10	1.55	1.23	1.50	2.80	1.44	5.20
8.....	1.40	2.70	1.65	1.16	1.51	2.30	1.36	3.50
9.....	1.54	5.20	1.57	1.23	1.45	2.70	1.37	3.60
10.....	2.13	36.00	1.57	1.16	1.40	2.30	1.44	5.20
11.....	1.57	5.72	1.59	1.23	1.35	1.90	1.45	4.40
12.....	1.47	3.50	1.60	1.30	1.40	2.80	1.46	5.70
13.....	1.63	7.80	1.74	3.10	1.45	3.90	1.46	5.70
14.....	1.95	25.00	1.70 <sub>d</sub>	2.50	1.47	4.40	1.40	4.10
15.....	1.86	19.70	1.67	2.10	1.40	3.50	1.38	3.80
16.....	1.73	12.60	1.64	1.78	1.35	2.40	1.37 <sub>a</sub>	3.60
17.....	1.70	11.00	1.67	2.30	1.35	2.40	1.37	3.50
18.....	1.99	26.00	1.65	2.10	1.32	2.10	1.35	3.30
19.....	1.78	14.80	1.62	1.90	1.35	2.80	1.23	3.00
20.....	1.70	10.40	1.65	2.40	1.34 <sub>e</sub>	2.80	1.32 <sub>a</sub>	2.85
21.....	1.60	5.60	1.70	3.30	1.23	3.00	1.32	2.80
22.....	1.86 <sub>d</sub>	18.00	1.65	2.70	1.32	2.80	1.31	2.70
23.....	2.13	33.00	1.53	2.50	1.32	2.80	1.31	2.70
24.....	2.02	26.00	1.63	2.70	1.31	2.70	1.31	2.70
25.....	1.85	16.40	1.60	2.30	1.30	2.50	1.30	2.50
26.....	1.80	13.10	1.53	1.54	1.30	2.50	1.31	2.70
27.....	1.75	9.90	1.54	1.66	1.30	2.50	1.32	2.80
28.....	1.70	6.80	1.53	1.66	1.29	2.40	1.31	2.70
29.....	1.82	12.60	1.52	1.66	1.29	2.40	1.32	2.80
30.....	1.72	6.80	1.52	1.90	1.29	2.40	1.34	3.10
31.....	1.72	6.50	1.50	1.78	.....	.....	1.35	3.30

*a* Interpolated gauge heights.

*d-e* Shifting conditions.

## MONTHLY DISCHARGE of Piapot Creek at Cumberland's Ranch, for 1915.

(Drainage area 55 square miles.)

MONTH.	DISCHARGE IN SECOND-Feet				Run-Off.	
	Maximum.	Minimum	Mean.	Per square Mile	Depth in inches on Drainage Area.	Total in Acre-feet
March (15-31).....	14.0	5.00	9.5	0.173	0.11	320
April.....	19.8	0.24	6.5	0.118	0.13	387
May.....	27.0	0.11	2.3	0.042	0.05	141
June.....	74.0	0.95	9.3	0.169	0.19	553
July.....	38.0	1.42	11.6	0.211	0.24	713
August.....	5.7	1.16	2.2	0.040	0.05	135
September.....	4.4	1.90	2.8	0.051	0.06	162
October.....	6.0	2.10	3.6	0.064	0.08	231
The period.....					0.80	2,697

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Crane Lake drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Dis-charge
May 3.....	J. E. Caughey.....	S. McCarthy Ditch.....	SE. 25-10-24-3.....	Nil.
May 3.....	do.....	Glennie Creek.....	do.....	0.369c
June 25.....	do.....	do.....	do.....	0.372c
July 22.....	do.....	do.....	do.....	0.079c

c Weir measurement.

## HAY LAKE DRAINAGE BASIN.

*General Description.*

Hay Lake is in Township 11, Range 25, West of the 3rd Meridian, and is fed by Hay Creek which rises in the Cypress Hills. It is a comparatively small body of saline water of an approximate area of three square miles. Like all lakes in this locality it has no outlet.

The basin supplies water for a number of irrigation schemes, and also to the town of Maple Creek for domestic and industrial purposes, the water being piped some nine miles by means of a gravity system.

The annual precipitation averages about twelve inches; during 1913 and 1914 it was slightly less than this amount.

## HAMMOND WEST DITCH FROM EAST BRANCH OF HAY CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 16, Tp. 10, Rgc. 25, W. 3rd Mer., twelve miles southeast of the town of Maple Creek and 12 feet from the dam.

*Records available.*—For irrigation season of 1915.

*Gauge.*—Vertical staff three feet long. Zero elevation maintained at 93.965 feet during 1915.

*Bench-mark.*—A three-quarter inch iron rod on a gravel knoll 250 feet east of the weir in the west ditch and midway between the east and west ditches; protected by rocks. Assumed elevation, 100.00 feet.

*Channel.*—One channel, heavy black loam, highly gravelled.

*Discharge measurements.*—Made directly from the ditch weir.

*Observer.*—G. R. Hammond.

*Note.*—Water for irrigation purposes was not used in 1915.

## DISCHARGE MEASUREMENTS of Hammond West Ditch from East Branch of Hay Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 3.....	J. E. Caughey.....	.....	.....	.....	.....	Dry.
May 26.....	do.....	.....	.....	.....	0.41	0.125a
June 22.....	do.....	.....	.....	.....	0.41	0.005a

a Weir measurement.

## HAMMOND EAST DITCH FROM EAST BRANCH OF HAY CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 16, Tp. 10, Rgc. 25, W. 3rd Mer., about twelve miles southeast of Maple Creek P. O. and 200 feet from intake of ditch.

*Records available.*—For irrigation season of 1915.

*Gauge.*—Vertical staff three feet long. Zero elevation maintained at 97.81 feet during 1915.

*Bench-mark.*—A three-quarter inch iron rod on a gravel knoll midway between the east and west ditches and 250 feet west of the station. Well protected by rocks. Assumed elevation, 100.00 feet.

*Channel.*—One channel with a gravelly clay bed.

*Discharge measurements.*—Made with current-meter or weir.

*Established.*—May 26, 1915, by M. H. French.

*Observer.*—G. R. Hammond.

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DISCHARGE MEASUREMENTS of Hammond East Ditch from East Branch of Hay Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Fl. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 26.....	J. E. Caughey.....				0.59	0.07 <sup>a</sup>
June 22.....	do.....					Dry.

<sup>a</sup> Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Hammond East Ditch from East Branch of Hay Creek, for 1915.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.60	0.07
2.....			0.60	0.07
3.....			0.60	0.07
4.....			0.60	0.07
5.....			0.60	0.07
6.....			0.60	0.07
7.....				
8.....				
9.....				
10.....				
11.....				
12.....				
13.....				
14.....				
15.....				
16.....				
17.....				
18.....				
19.....				
20.....				
21.....				
22.....				
23.....				
24.....				
25.....				
26.....	0.59	0.07		
27.....	0.70	0.10		
28.....	0.70	0.10		
29.....	0.70	0.10		
30.....	0.70	0.10		
31.....	0.70	0.10		

MONTHLY DISCHARGE of Hammond East Ditch from East Branch of Hay Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-Feet.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May.....	0.10	0.07	0.10	1.18
June.....	0.07	0.07	0.07	0.83
The period.....				2.01

## HAY CREEK AT HAY CREEK SCHOOL.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 29, Tp. 10, Rge. 25, W. 3rd Mer.*Records available.*—March 24, 1911, to October 31, 1915.*Gauge.*—Vertical staff. Zero elevation has been maintained at 94.79 feet since establishment.



*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Slightly shifting.

*Discharge measurements.*—Made with weir at ordinary stages and with a meter in high water periods.

*Winter flow.*—This station is not maintained during the winter.

*Diversions.*—The town of Maple Creek takes its water from springs at the head of this creek.

*Observer.*—Miss M. E. Fauquier.

### DISCHARGE MEASUREMENTS of Hay Creek at Hay Creek School, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 29.....	J. E. Caughey.....				1.20	0.44 <sub>a</sub>
April 6.....	do.....	5.0	5.40	1.36	1.70	7.38
May 4.....	do.....				1.15	0.11 <sub>a</sub>
May 26.....	do.....				1.17	0.28 <sub>a</sub>
June 22.....	do.....				1.25	0.59 <sub>a</sub>
July 20.....	do.....	6.0	1.85	0.64	1.31	1.19
Aug. 11.....	do.....				1.16	0.02 <sub>a</sub>
Sept. 1.....	G. H. Whyte and J. E. Caughey.....				1.19	0.06 <sub>a</sub>
Sept. 16.....	J. E. Caughey.....				1.20	0.14 <sub>a</sub>
Oct. 2.....	do.....				1.18	0.14 <sub>a</sub>
Oct. 20.....	do.....				1.15	0.12 <sub>a</sub>
Nov. 5.....	do.....				1.16	0.08 <sub>a</sub>

*a* Weir measurement.

### DAILY GAUGE HEIGHT AND DISCHARGE of Hay Creek at Hay Creek School, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.18	0.29	1.12	0.09	1.17	0.26
2.....			1.82	10.30	1.12	0.09	1.15	0.19
3.....			2.20	19.40	1.16	0.09	1.25	0.68
4.....			1.91	12.40	1.17	0.22	1.50	3.40
5.....			1.84	10.80	1.20	0.26	1.50	3.40
6.....			1.70	7.40	1.20	0.36	1.35	1.50
7.....			1.58	4.80	1.20	0.36	1.25	0.68
8.....			1.54	4.10	1.19	0.33	1.15	0.19
9.....			1.50	3.40	1.20	0.36	1.15	0.19
10.....			1.42	2.30	1.14	0.16	1.15	0.19
11.....			1.36	1.60	1.14	0.16	1.16	0.22
12.....			1.32	1.20	1.14	0.16	1.15	0.19
13.....			1.40	2.00	1.15	0.19	1.15	0.19
14.....			1.34	1.40	1.20	0.36	1.13	0.12
15.....			1.28	0.87	1.35	1.50	1.13	0.12
16.....			1.28	0.87	1.65	6.30	1.13	0.12
17.....			1.27	0.81	1.68	7.00	1.13	0.12
18.....			1.26	0.74	1.45	2.70	1.13	0.12
19.....			1.22	0.49	1.45	2.70	1.15	0.19
20.....			1.24	0.62	1.45	2.70	1.20	0.36
21.....	1.89 <sub>a</sub>	2.00	1.17	0.26	1.45	2.70	1.25	0.68
22.....	1.81 <sub>a</sub>	2.00	1.15	0.19	1.40	2.00	1.25	0.68
23.....	1.55 <sub>a</sub>	2.00	1.16	0.22	1.40	2.00	1.15	0.19
24.....	1.43	2.40	1.15	0.19	1.15	0.19	1.15	0.19
25.....	1.85	11.00	1.15	0.19	1.15	0.19	1.15	0.19
26.....	1.85	11.00	1.15	0.19	1.17	0.26	1.15	0.19
27.....	1.65	6.30	1.15	0.19	1.15	0.19	1.15	0.19
28.....	1.45	2.70	1.20	0.36	1.15	0.19	1.17	0.26
29.....	1.20	0.36	1.16	0.22	1.17	0.26	1.15	0.19
30.....	1.22	0.49	1.18	0.29	1.15	0.19	1.15	0.19
31.....	1.19	0.33			1.15	0.19		

*a* Ice conditions, estimated flow.

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DAILY GAUGE HEIGHT AND DISCHARGE of Hay Creek at Hay Creek School, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.15	0.19	1.25	0.36	1.19	0.11	1.16	0.08
2.....	1.15	0.19	1.24	0.31	1.26	0.41	1.16	0.05
3.....	1.16	0.22	1.21	0.17	1.25	0.36	1.18	0.10
4.....	1.20	0.36	1.19	0.11	1.20	0.12	1.18	0.10
5.....	1.19	0.33	1.18	0.10	1.20	0.12	1.18	0.10
6.....	1.21	0.42	1.16	0.08	1.24	0.31	1.18	0.10
7.....	1.22	0.49	1.15	0.06	1.20	0.12	1.18	0.10
8.....	1.50	3.40	1.14	0.05	1.20	0.12	1.18	0.10
9.....	1.70	7.40	1.14	0.05	1.20	0.12	1.18	0.10
10.....	1.35	1.50	1.14	0.05	1.25	0.36	1.18	0.10
11.....	1.21	0.42	1.14	0.05	1.25	0.36	1.18	0.10
12.....	1.21	0.42	1.14	0.05	1.25	0.36	1.18	0.10
13.....	1.32	1.20	1.16	0.08	1.25	0.36	1.18	0.10
14.....	1.45	2.70	1.16	0.08	1.25	0.36	1.18	0.10
15.....	1.33	1.30	1.08	0.01	1.25	0.36	1.18	0.10
16.....	1.24	0.62	1.12	0.03	1.21	0.17	1.18	0.10
17.....	1.35	1.50	1.25	0.36	1.20	0.12	1.18	0.10
18.....	1.42	2.30	1.30	0.60	1.20	0.12	1.18	0.10
19.....	1.32	1.20	1.28	0.50	1.20	0.12	1.18	0.10
20.....	1.31	1.10	1.28	0.50	1.19	0.11	1.18	0.10
21.....	1.23	0.55	1.15	0.06	1.19	0.11	1.18	0.10
22.....	1.28	0.87	1.16	0.08	1.18	0.10	1.18	0.10
23.....	1.48	2.40	1.18	0.10	1.17	0.09	1.18	0.10
24.....	1.37	1.16	1.18	0.10	1.16	0.08	1.18	0.10
25.....	1.32	0.76	1.18	0.10	1.16	0.08	1.18	0.10
26.....	1.31	0.68	1.18	0.10	1.16	0.08	1.18	0.10
27.....	1.29	0.55	1.18	0.10	1.16	0.08	1.18	0.10
28.....	1.30	0.60	1.18	0.10	1.16	0.08	1.18	0.10
29.....	1.32	0.76	1.18	0.10	1.16	0.08	1.18	0.10
30.....	1.29	0.55	1.18	0.10	1.16	0.08	1.18	0.10
31.....	1.27	0.46	1.18	0.10	.....	.....	1.18	0.10

## MONTHLY DISCHARGE of Hay Creek at Hay Creek School, for 1915.

(Drainage area 22 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31)	11.00	0.33	3.70	0.17	0.07	81
April.....	19.40	0.19	2.90	0.13	0.14	173
May.....	7.00	0.09	1.11	0.05	0.06	68
June.....	3.40	0.12	0.51	0.02	0.03	3
July.....	2.70	0.19	1.18	0.05	0.06	73
August.....	0.60	0.01	0.15	0.01	0.01	9
September.....	0.41	0.08	0.18	0.01	0.01	11
October.....	0.10	0.08	0.10	0.01	0.01	6
The period.	.....	.....	.....	.....	0.39	451

## FAUQUIER DITCH FROM HAY CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 30, Tp. 10, Rge. 25, W. 3rd Mer., about twenty feet downstream from the headgate.

*Records available.*—For irrigation season of 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 94.80 feet since March 29, 1915.

*Bench-mark.*—Permanent iron bench-mark, located 300 feet east of the gauge and across Hay Creek. Assumed elevation, 100.00 feet.

*Channel.*—One channel at all stages.

*Discharge measurements.*—Made with a weir.

*Observer.*—Miss M. Fauquier.

## DISCHARGE MEASUREMENTS of Fauquier Ditch from Hay Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 29.....	J. E. Caughey.....	.....	.....	.....	.....	NIL.
May 26.....	do.....	.....	.....	.....	1.24	0.26 <sup>a</sup>
June 22.....	do.....	.....	.....	.....	0.99	NIL. <sup>b</sup>

<sup>a</sup> Weir measurement.

<sup>b</sup> Water standing in pools.

## DAILY GAUGE HEIGHT AND DISCHARGE of Fauquier Ditch from Hay Creek, for 1915.

DAY.	April.		May.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	.....	.....	1.14	0.18
2.....	.....	.....	1.14	0.18
3.....	.....	.....	1.14	0.18
4.....	.....	.....	1.15	0.19
5.....	.....	.....	1.15	0.19
6.....	.....	.....	1.15	0.19
7.....	.....	.....	1.15	0.19
8.....	.....	.....	1.15	0.19
9.....	.....	.....	1.15	0.19
10.....	.....	.....	1.10	0.15
11.....	.....	.....	1.10	0.15
12.....	.....	.....	1.10	0.15
13.....	1.35	0.38	1.15	0.19
14.....	1.40	0.43	1.20	0.22
15.....	1.24	0.26	1.45	0.49
16.....	1.27	0.29	.....	.....
17.....	1.23	0.25	.....	.....
18.....	1.25	0.27	.....	.....
19.....	1.24	0.26	.....	.....
20.....	1.23	0.25	.....	.....
21.....	1.17	0.20	.....	.....
22.....	1.16	0.19	.....	.....
23.....	1.15	0.19	.....	.....
24.....	1.16	0.19	.....	.....
25.....	1.16	0.19	.....	.....
26.....	1.16	0.19	.....	.....
27.....	1.16	0.19	.....	.....
28.....	1.21	0.23	.....	.....
29.....	1.17	0.20	.....	.....
30.....	1.19	0.21	.....	.....
31.....	.....	.....	.....	.....

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## MONTHLY DISCHARGE of Fauquier Ditch from Hay Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (13-30).....	0.43	0.19	0.24	8.57
May (1-15).....	0.49	0.15	0.20	5.95
The period.....				14.52

## PEACOCK WEST DITCH NEAR MAPLE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 36, Tp. 10, Rge. 26, W. 3rd Mer., about five miles southeast of Maple Creek, Saskatchewan.

*Gauge.*—Vertical staff, situated on right side of ditch about 55 feet below the headgate. Zero elevation maintained at 98.50 feet since establishment.

*Bench-mark.*—On a wooden plug, used as I. P. for soundings, situated on the right side of ditch about four feet below the gauge. Assumed elevation, 100.00 feet.

*Channel.*—One channel, clay loam bed.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—F. W. Peacock.

*Remarks.*—This station was established on May 19, 1915, by M. H. French. No records were obtained in 1915.

## PEACOCK EAST DITCH NEAR MAPLE CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 36, Tp. 10, Rge. 26, W. 3rd Mer., five miles southeast of Maple Creek, Saskatchewan.

*Gauge.*—Vertical staff, situated on the right bank of the ditch about 100 feet below the intake. Zero elevation maintained at 98.63 feet since establishment.

*Bench-mark.*—On a wooden plug on the right side of ditch about five feet below the gauge; used also as I. P. for soundings. Assumed elevation, 100.00 feet.

*Channel.*—One channel, clay loam bed.

*Discharge measurements.*—Made by meter or weir.

*Observer.*—F. W. Peacock.

*Remarks.*—This station was established on May 19, 1915, by M. H. French. No records were obtained in 1915.

## HAY CREEK AT FAUQUIER'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 30, Tp. 10, Rge. 25, W. 3rd Mer.

*Records available.*—April 25, 1909, to October 31, 1914. One discharge measurement in 1915.

*Remarks.*—Station not maintained during 1915.

## DISCHARGE MEASUREMENTS of Hay Creek at Fauquier's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 17.....	J. E. Caughey.....	2.0	0 30	0 31	0.62	0 15

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Hay Lake drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Discharge.	
				Imperial Gallons per 24 hours.	Sec.-ft.
Jan. 15.....	J. E. Caughey.....	Ram Spring.....	SE. 20-10-25-3.....	8,989a	0.0167
Feb. 15.....	F. R. Steinberger.....	do.....	do.....		b
Mar. 17.....	J. E. Caughey.....	do.....	do.....	13,672a	0.0254
April 6.....	do.....	do.....	do.....	39,830a	0.0740
May 26.....	do.....	do.....	do.....	33,481a	0.0622
June 22.....	do.....	do.....	do.....	24,437a	0.0454
July 20.....	do.....	do.....	do.....	36,603a	0.0680
Aug. 11.....	do.....	do.....	do.....	18,785a	0.0349
Sept. 1.....	G. H. Whyte and J. E. Caughey.....	do.....	do.....	18,785a	0.0349
Sept. 16.....	J. E. Caughey.....	do.....	do.....	30,358a	0.0564
Oct. 2.....	do.....	do.....	do.....	21,584a	0.0401
Oct. 20.....	do.....	do.....	do.....	11,250a	0.0209
Nov. 2.....	do.....	do.....	do.....	18,786a	0.0345
Jan. 15.....	do.....	Upper Spring.....	SE. 10-10-25-3.....	83,002a	0.1498
Feb. 15.....	F. R. Steinberger.....	do.....	do.....	64,482a	0.1198
May 26.....	J. E. Caughey.....	do.....	do.....	104,422a	0.1940
June 22.....	do.....	do.....	do.....	104,307a	0.1938
July 20.....	do.....	do.....	do.....	120,519a	0.2180
Aug. 11.....	do.....	do.....	do.....	76,112a	0.1414
Sept. 1.....	G. H. Whyte and J. E. Caughey.....	do.....	do.....	97,104a	0.1804
Sept. 16.....	J. E. Caughey.....	do.....	do.....	104,317a	0.1938
Oct. 2.....	do.....	do.....	do.....	104,349a	0.1939
Oct. 20.....	do.....	do.....	do.....	97,104a	0.1804
Jan. 15.....	do.....	Saunders Spring.....	SE. 20-10-25-3.....	336,420a	0.6250
Feb. 15.....	F. R. Steinberger.....	do.....	do.....	311,121e	0.5780
Mar. 17.....	J. E. Caughey.....	do.....	do.....	303,552f	0.5640
April 6.....	do.....	do.....	do.....	483,840a	0.8990
May 26.....	do.....	do.....	do.....	489,182a	0.9088
June 22.....	do.....	do.....	do.....	483,906a	0.8990
July 20.....	do.....	do.....	do.....	486,059a	0.9030
Aug. 11.....	do.....	do.....	do.....	503,876a	0.9361
Sept. 1.....	G. H. Whyte and J. E. Caughey.....	do.....	do.....	426,904a	0.7931
Sept. 16.....	J. E. Caughey.....	do.....	do.....	415,330a	0.7716
Oct. 2.....	do.....	do.....	do.....	445,689a	0.8280
Oct. 20.....	do.....	do.....	do.....	445,689a	0.8280
Nov. 2.....	J. E. Caughey and M. H. French.....	do.....	do.....	428,464a	0.7960

a Weir measurement.

b Flow very small.

c-f Capacity measurements

## BIGSTICK LAKE DRAINAGE BASIN.

## General Description.

Bigstick is one of the largest lakes in the Northern Cypress Hills district. It is situated about Township 15, Range 25, West of the 3rd Meridian, and covers an area of thirty-five square miles. The lake is alkaline in character and has no outlet.

The only source of supply of the lake is Maple Creek which with its tributary, Gap Creek, rises in the Cypress Hills thirty miles south. On the south and east, the lake is bounded by the sand hills. The drainage area is 820 square miles.

The topography of the drainage basin is for the most part gently rolling, and the creek slope is small except near the source. The basin is bare of trees except in the hills. The channel is flat, wide and in most places sandy.

There are several small irrigation ditches in the basin.

## ADAMS NORTH DITCH FROM CYPRESS CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 10, Tp. 9, Rge. 27, W. 3rd Mer., at Geo. A. Adams' ranch.

*Records available.*—For irrigation seasons of 1914-15.

*Gauge.*—Vertical staff, located near the left bank and fifty feet below the headgate. Elevation of zero 97.14 feet.

*Bench-mark.*—Top of wooden stake about eight feet from gauge on the left bank. Assumed elevation, 100.00 feet.

*Control.*—A permanent twenty-four-inch sharp crested weir, with complete end contractions, acts as a control. The crest of the weir is maintained at an elevation of 99.09 feet.

*Channel.*—Composed of a black sandy loam.

*Discharge measurements.*—Computed from the measured head over the 24-inch weir.

*Observer.*—Geo. A. Adams.

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## DISCHARGE MEASUREMENTS of Adams North Ditch from Cypress Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 29.....	H. W. Rowley.....				2.01	0.10
July 12.....	do.....				Dry.	Nil.
Aug. 26.....	do.....					

## DAILY GAUGE HEIGHT AND DISCHARGE of Adams North Ditch from Cypress Creek, for 1915.

DAY.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.20	0.81
2.....			2.15	0.53
3.....			2.27	1.12
4.....			2.24	1.10
5.....			2.21	0.81
6.....			2.09	0.34
7.....			2.07	0.27
8.....			2.06	0.24
9.....			2.05	0.20
10.....			2.06	0.24
11.....			2.06	0.24
12.....			2.04	0.18
13.....			2.04b	0.18
14.....			2.04	0.18
15.....			2.04	0.18
16.....			2.04	0.18
17.....			2.05	0.20
18.....			2.04	0.18
19.....			2.08	0.31
20.....			2.07b	0.27
21.....			2.06	0.24
22.....			2.05	0.20
23.....			2.04b	0.18
24.....			2.03	0.15
25.....			2.04b	0.18
26.....			2.07c	0.27
27.....				
28.....	2.02a	0.12		
29.....	2.01	0.10		
30.....	2.00	0.07		
31.....	2.01	0.10		

a Headgate opened.

b Gauge height interpolated.

c Headgate closed.

## MONTHLY DISCHARGE of Adams North Ditch from Cypress Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
May (28-31).....	0.12	0.07	0.10	Nil.
June (1-26).....	1.12	0.15	0.35	18
The period.....				18

## ADAMS SOUTH DITCH FROM CYPRESS CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 10, Tp. 9, Rge. 27, W. 3rd Mer., at Geo. A. Adams' ranch.

*Records available.*—For the irrigation seasons of 1914-15.

*Gauge.*—Vertical staff, located near the left bank, about 100 feet below the headgate. Elevation of zero, 91.54 feet.

*Bench-mark.*—Permanent iron bench-mark located in the quarter-section line 200 feet south of the gauge rod and weir. Assumed elevation, 100.00 feet.

*Control.*—A permanent twenty-four-inch sharp crested weir, with complete end contractions, is used as a control. The elevation of the crest is maintained at 93.22 feet.

*Channel.*—Composed of sandy loam.

*Discharge measurements.*—Computed from the measured head over the weir.

*Observer.*—Geo. A. Adams.

## DISCHARGE MEASUREMENTS of Adams South Ditch from Cypress Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 29.....	H. W. Rowley.....				Dry.	Nil.
July 12.....	do.....				"	"
Aug. 26.....	do.....				"	"

## DAILY GAUGE HEIGHT AND DISCHARGE of Adams South Ditch from Cypress Creek, for 1915.

DAY.	April.		May.		June.		July-August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.11 <sup>a</sup>	1.81	1.76 <sup>b</sup>	0.15	2.06	1.50	c.....				1.78	0.20
2.....	2.11	1.81	1.76	0.15	2.06	1.50			1.78	0.20	1.79	0.24
3.....	2.16	2.10	1.79	0.24	2.09	1.69			1.79	0.24	1.96	0.96
4.....	2.14	1.99	1.78	0.20	2.07	1.56			1.80	0.27	1.83	0.38
5.....	2.07	1.56	1.77	0.18	2.06	1.50			1.78	0.20	1.79	0.24
6.....	2.04	1.38	1.77	0.18	1.88	0.58			1.76	0.15	1.83	0.38
7.....	1.90	0.67	1.78	0.20	1.90	0.67			1.78	0.20	1.78	0.20
8.....	1.97	1.00	1.77	0.18	1.81	0.31			1.79	0.24	1.79	0.24
9.....	1.93	0.81	1.79	0.24	1.79	0.24			1.80	0.27	1.78	0.20
10.....	1.87	0.31	1.76	0.15	1.81	0.31			1.78	0.20		
11.....	1.81	0.31	1.76	0.15	1.79	0.24			1.78	0.20		
12.....	1.86	0.50	1.76	0.15	1.76	0.15			1.79	0.24		
13.....	1.87	0.53	1.76	0.15	1.76 <sup>b</sup>	0.15			1.80	0.27		
14.....	1.95	0.91	1.85	0.46	1.76	0.15			1.79	0.24		
15.....	1.78	0.20	2.02	1.28	1.76	0.15			1.79	0.24		
16.....	1.88	0.58	1.96	0.96	1.76	0.15			1.79	0.24		
17.....	1.88	0.58	1.86	0.50	1.77	0.18			1.77	0.18		
18.....	1.94	0.86	1.81	0.31	1.84	0.42			1.88	0.58		
19.....	1.80	0.27	1.81	0.31	1.81	0.31			1.79	0.24		
20.....	1.83	0.38	1.81	0.31	1.80	0.27			1.77	0.18		
21.....	1.80	0.27	1.81	0.31	1.79	0.24			1.76	0.15		
22.....	1.76	0.15	1.80	0.27	1.75	0.12			1.74	0.10		
23.....	1.82	0.34	1.78	0.20	1.74	0.10			1.74	0.10		
24.....	1.83	0.38	1.77	0.18	1.74 <sup>b</sup>	0.10			1.78	0.20		
25.....	1.80	0.27	1.78	0.20	1.73	0.07			1.78 <sup>b</sup>	0.20		
26.....	1.79	0.24	1.78	0.20					1.78	0.20		
27.....	1.77	0.18	1.76	0.15					1.79	0.24		
28.....	1.80	0.27	1.76	0.15					1.78	0.20		
29.....	1.81	0.31	1.77	0.18					1.76	0.15		
30.....	1.80	0.27	1.77	0.18					1.76	0.15		
31.....			1.76	0.15								

<sup>a</sup> Headgate opened.

<sup>b</sup> Gauge height interpolated.

<sup>c</sup> No water used during July and August



## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Adams South Ditch from Cypress Creek, for 1915.

MONTH.	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April.....	2.10	0.15	0.70	42.0
May.....	1.28	0.15	0.28	17.0
June.....	1.69	0.07	0.51	25.0
July.....				Nil.
August.....				"
September.....	0.58	0.10	0.22	11.0
October.....	0.96	0.20	0.33	6.0
The period.....				101.0

## GEORGE POLLOCK'S EAST DITCH FROM CYPRESS CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 17, Tp. 9, Rge. 27, W. 3rd Mer., about fifty feet below headgate of irrigation ditch.

*Gauge.*—Vertical staff, fastened to post driven into bed of ditch. Zero maintained 0.85 feet below crest of permanent weir.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made by measuring head over permanent weir, located ten feet below gauge rod.

*Control.*—A permanent sharp crested rectangular weir with thirty-six-inch crest.

*Observer.*—George Pollock.

*Remarks.*—This station was established May 19, 1914, by H. R. Carscallen. No water used during 1915 irrigation season.

## GEORGE POLLOCK'S WEST DITCH FROM CYPRESS CREEK.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 17, Tp. 9, Rge. 27, W. 3rd Mer., about 700 feet below headgate.

*Gauge.*—Vertical staff, fastened to post driven into the bed of the ditch near the left bank. Zero maintained at 0.61 feet below crest of permanent weir.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made by measuring head over permanent weir.

*Control.*—A permanent sharp crested rectangular weir, ten feet below gauge rod, with thirty-six-inch crest.

*Observer.*—George Pollock.

*Remarks.*—This station was established May 19, 1914, by H. R. Carscallen. No water was used during irrigation season of 1915.

## WM. SMALL DITCH FROM MCSHANE CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 22, Tp. 9, Rge. 27, W. 3rd Mer., 1,500 feet below headgate.

*Gauge.*—Vertical staff driven into the bed of the ditch near the left bank. Zero maintained at 95.92 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark located on the left bank five feet below the gauge rod and two feet from edge of ditch.

*Channel.*—Composed of gravel and sand, slightly shifting.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Wm. Small.

*Remarks.*—This station was established November 22, 1915, by R. B. Williamson.

## MCSHANE CREEK AT SMALL'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 3, Tp. 10, Rge. 27, W. 3rd Mer., at the highway bridge, near Wm. Small's house.

*Records available.*—April 24, 1909, to April 24, 1915.

*Gauge.*—Vertical staff. Zero of gauge was maintained at 86.41 feet during 1909-10; zero of gauge was maintained at 85.71 feet during 1911-12; zero of gauge was maintained at 85.21 feet during 1913; zero of gauge was maintained at 85.74 feet during 1914-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand and gravel and shifting during flood stages.

*Discharge measurements.*—Made by wading or from the highway bridge during flood stages.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—A. M. Small.

*Remarks.*—Gauge records were discontinued on April 24, 1915, as the records were not considered of sufficient value to justify the expense of obtaining them.

## DISCHARGE MEASUREMENTS of McShane Creek at Small's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 15.....	J. E. Caughey.....	0.0			0.50	Nil.
Mar. 31.....	do.....	<i>a</i>			0.43	0.16
April 9.....	do.....	7.0	4.2	1.70	0.85	7.00
April 16.....	do.....	<i>a</i>			0.70	0.97
June 12.....	H. W. Rowley.....	9.0	3.9	0.42	0.72	1.64
July 14.....	do.....	14.0	7.0	1.40	1.02	9.80
July 28.....	do.....	<i>a</i>			1.02	0.49
Aug. 26.....	do.....				Dry.	Nil.
Sept. 18.....	do.....				<i>a</i>	
Oct. 15.....	do.....				"	"

*a* Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of McShane Creek at Small's Ranch, for 1915.

DAY.	March.		April.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			0.78	5.00
2.....			1.38	31.00
3.....			1.42	33.00
4.....			1.22	23.00
5.....			1.12	18.00
6.....			1.00	12.50
7.....			0.95	10.60
8.....			0.87	7.70
9.....			0.84	6.70
10.....			0.70	3.20
11.....			0.68	2.90
12.....			0.69	3.00
13.....			0.76	4.60
14.....			0.78	5.00
15.....			0.62	1.84
16.....			0.65	0.82
17.....	1.19 <sup>a</sup>	22.0	0.72	1.52
18.....	1.12	18.0	0.65	0.82
19.....	1.10	17.0	0.61	0.52
20.....	0.95	10.6	0.54	0.24
21.....	1.14	19.0	0.51	0.14
22.....	1.36	30.0	0.53	0.20
23.....	1.20	22.0	0.54	0.24
24.....	0.96	10.9	0.51	0.14
25.....	0.90	8.6	<i>b</i>	
26.....	0.85	7.0		
27.....	0.85	7.0		
28.....	0.74	4.1		
29.....	0.69	3.0		
30.....	0.72	3.7		
31.....	0.72	3.7		

<sup>a</sup> Creek started to flow.<sup>b</sup> Station discontinued.

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of McShane Creek at Small's Ranch, for 1915.

(Drainage area 27.5 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (17-31).....	30.00	3.00	12.5	0.454	0.25	371
April (1-24) <sup>a</sup> .....	33.00	0.14	7.2	0.262	0.20	343
The period.....					0.45	714

<sup>a</sup> Station discontinued April 24, 1915.

## GAP CREEK AT SMALL'S RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 4, Tp. 10, Rge. 27, W. 3rd Mer., at Wm. Small's ranch.*Records available.*—April 24, 1909, to October 31, 1915.*Gauge.*—Vertical staff. The zero of the gauge was maintained at 66.53 feet during 1909-10; the zero of the gauge was maintained at 66.62 feet during 1911; the zero of the gauge was maintained at 66.63 feet during 1912-15.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Channel.*—Composed of loose stones and gravel and liable to shift during flood stages.*Discharge measurements.*—Made from cable car during high stages, by wading or with a weir during low stages.*Winter flow.*—Station discontinued during winter season.*Observer.*—A. Small.

## DISCHARGE MEASUREMENTS of Gap Creek at Small's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 15	J. E. Caughey	14	11 4	0 17	2 25	1 93
Mar. 31	do	28	29 0	1 14	2 54	33 00
April 9	do	29	33 8	1 40	2 67	46 00
April 16	do	25	25 4	0 67	2 37	17 29
April 29	H. W. Rowley	<sup>a</sup>			2 00	0 83
May 27	do	<sup>a</sup>			2 09	2 00
June 12	do	11	7 8	1 13	2 30	8 80
July 14	do	33	48 0	1 90	3 02	91 09
July 28	do	9	5 9	0 63	2 22	3 70
Aug. 26	do				1 84	"
Sept. 18	do				1 88	"
Oct. 15	do	<sup>a</sup>			2 07	1 57
Nov. 3	Whyte and Rowley	8	4 0	0 20	2 02	0 80

<sup>a</sup> Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Gap Creek at Small's Ranch, for 1915.

DAY	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.54	32.00	2.00	0.60	2.01	0.72
2.....			3.20	141.00	1.99	0.54	2.41	18.90
3.....			4.05	820.00	1.98	0.48	3.53	394.00
4.....			3.62	467.00	1.97	0.42	4.35	1,066.00
5.....			3.20	141.00	1.96	0.36	3.51	377.00
6.....			2.88	70.00	1.95	0.30	3.04	94.00
7.....			2.92	75.00	1.95	0.30	2.68	47.00
8.....			2.86	67.00	1.95	0.30	2.56	34.00
9.....			2.72	51.00	1.95	0.30	2.40	18.00
10.....			2.62	40.00	1.94	0.26	2.33	12.00
11.....			2.52	30.00	1.94	0.26	2.31	10.50
12.....			2.48	26.00	1.94	0.26	2.30	9.80
13.....			2.58	36.00	1.95	0.30	2.30	9.80
14.....			2.60	38.00	2.10	2.20	2.25	7.00
15.....			2.48	26.00	2.73	52.00	2.22	5.70
16.....			2.36	14.00	3.16	126.00	2.14	3.10
17.....			2.36	14.00	2.72	51.00	2.14	3.10
18.....	2.55	33	2.32	11.00	2.35	13.50	2.14	3.10
19.....	3.49	361	2.27	8.00	2.25	7.00	2.15	3.30
20.....	3.54	402	2.24	6.60	2.15	3.30	2.35	13.50
21.....	3.58	435	2.16	3.60	2.12	2.60	2.28	8.70
22.....	4.00	779	2.15	3.30	2.08	1.80	2.23	6.10
23.....	4.10	861	2.14	3.10	2.08	1.80	2.15	3.30
24.....	3.43	311	2.13	2.90	2.06	1.40	2.11	2.40
25.....	3.27	183	2.13	2.90	2.06	1.40	2.08	1.80
26.....	3.10	108	2.10	2.20	2.07	1.60	2.13	2.90
27.....	2.84	65	2.05	1.20	2.07	1.60	2.19	4.50
28.....	2.70	49	2.03	0.96	2.05	1.20	2.12	2.60
29.....	2.74	53	2.00	0.60	2.05	1.20	2.12	2.60
30.....	2.71	50	1.99	0.54	2.05	1.20	2.11	2.40
31.....	2.59	37			2.03	0.96		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Gap Creek at Small's Ranch, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.10	2.20	2.48	26.00	1.81	Nil.	1.88	0.06
2.....	2.08	1.80	2.46	24.00	1.89	0.08	1.88	0.06
3.....	2.04	1.08	2.46	24.00	1.84	Nil.	2.13	2.90
4.....	2.01	0.72	2.45	23.00	1.84	"	2.10	2.20
5.....	2.01	0.72	2.40	18.00	1.83	"	2.10	2.20
6.....	1.98	0.48	2.36	14.00	1.83	"	2.09	2.00
7.....	1.97	0.42	2.32	11.00	1.86	0.02	2.07	1.60
8.....	2.24	6.60	2.25	7.00	1.88	0.06	2.04	1.08
9.....	2.24	6.60	2.12	2.60	1.88	0.06	2.04	1.08
10.....	2.30	9.80	2.04	1.08	1.87	0.04	2.10	2.20
11.....	2.23	6.10	2.04	1.08	1.86	0.02	2.16	3.60
12.....	2.12	2.60	2.02	0.84	1.86	0.02	2.15	3.30
13.....	2.63	41.00	1.96	0.36	1.88	0.06	2.14	3.10
14.....	2.93	76.00	1.93	0.22	1.90	0.10	2.10	2.20
15.....	2.63	41.00	1.93	0.22	1.93	0.22	2.07	1.60
16.....	2.39	17.10	1.93	0.22	1.93	0.22	2.04	1.68
17.....	2.45	23.00	1.90	0.10	1.88	0.06	2.04	1.08
18.....	2.85	66.00	1.90	0.10	1.88	0.06	2.00	0.60
19.....	2.55	33.00	1.90	0.10	1.90	0.10	2.03	0.96
20.....	2.38	16.20	1.90	0.10	1.93	0.22	2.03	0.96
21.....	2.30	9.80	1.90	0.10	1.93	0.22	2.06	0.60
22.....	2.25	7.00	1.90	0.10	1.90	0.10	2.01	0.72
23.....	2.70	49.00	1.90	0.10	1.88	0.06	2.03	0.96
24.....	2.70	49.00	1.89	0.08	1.88	0.06	2.03	0.96
25.....	2.45	23.00	1.88	0.06	1.88	0.06	2.03	0.96
26.....	2.32	11.00	1.84	Nil.	1.87	0.04	2.01	0.72
27.....	2.24	6.60	1.83	"	1.87	0.04	2.04	1.08
28.....	2.20	4.80	1.82	"	1.87	0.04	2.02	0.84
29.....	2.70	49.00	1.81	"	1.87	0.04	2.03	0.96
30.....	2.51	29.00	1.81	"	1.88	0.06	1.94	0.26
31.....	2.49	27.00	1.80	"	.....	.....	1.96	0.36

## MONTHLY DISCHARGE of Gap Creek at Small's Ranch, for 1915.

(Drainage area 108 square miles.)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (18-31).....	801.00	33.00	266.00	2.460000	1.2800	7.391
April.....	820.00	0.54	71.00	0.659000	0.7400	4.225
May.....	120.00	0.26	8.90	0.082400	0.1000	547
June.....	1,066.00	0.72	72.00	0.667000	0.7400	4.284
July.....	76.00	0.42	19.90	0.184000	0.2100	1.224
August.....	26.00	0.00	5.60	0.046300	0.0500	307
September.....	0.22	0.00	0.07	0.000648	0.0007	4
October.....	3.60	0.06	1.35	0.012500	0.0100	83
The period.....					3.1307	18.065

## GAP CREEK NEAR MAPLE CREEK.

*Location.*—On the road allowance east of the NE.  $\frac{1}{4}$  Sec. 31, Tp. 11, Rge. 26, W. 3rd Mer., at the highway traffic bridge.

*Records available.*—May 4, 1910, to April 30, 1915.

*Gauge.*—Vertical staff. The zero of the gauge was maintained at 81.44 feet during 1910-11; the zero of the gauge was maintained at 81.61 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand and shifting.

*Discharge measurements.*—Made from bridge, by wading or with a weir.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—Miss Kate Williams.

*Remarks.*—Gauge height records were discontinued at this station on April 30, 1915, as a new station was established on Maple Creek below Gap Creek.

## DISCHARGE MEASUREMENTS of Gap Creek near Maple Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 22.....	J. E. Caughey.....	47	103.6	1.82	3.88	189
April 1.....	do.....	28	25.0	1.21	2.19	33
April 5.....	do.....	47	141.5	2.01	4.35	284
April 8.....	do.....	30	39.1	1.70	2.63	66
April 15.....	do.....	28	29.4	1.32	2.18	38
June 7.....	R. J. McGuinness.....	47	105.6	1.36	3.24	143

## DAILY GAUGE HEIGHT AND DISCHARGE of Gap Creek near Maple Creek, for 1915.

DAY.	March..		April.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			2.19	36.0
2.....			2.99	94.0
3.....			6.62	1,167.0
4.....			6.58	1,151.0
5.....			6.44	1,095.0
6.....			6.37	1,067.0
7.....			6.31	1,043.0
8.....			6.23	1,011.0
9.....			6.10	959.0
10.....			5.09	555.0
11.....			4.10	226.0
12.....			3.90	192.0
13.....			2.23	39.0
14.....			2.11	32.0
15.....			2.08	30.0
16.....			2.00	26.0
17.....			1.81	17.4
18.....			1.69	12.7
19.....			1.56	8.8
20.....			1.56	8.8
21.....	3.18	110	1.56	8.8
22.....	3.88	189	1.55	7.5
23.....	5.78	831	1.55	7.5
24.....	4.59	358	1.54	7.2
25.....	5.39	675	1.54	7.2
26.....	4.25	259	1.54	7.2
27.....	3.11	104	1.54	7.2
28.....	2.99	94	1.54	7.2
29.....	2.40	49	1.54	7.2
30.....	2.42	50	1.54	7.2
31.....	2.29	42		

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Gap Creek near Maple Creek, for 1915.

(Drainage area 274 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31).....	839	42.0	251	0.916	0.37	5,475
April.....	1,167	7.2	295	1.080	1.20	17,554
The period.....					1.57	23,029

## MAPLE CREEK AT MAPLE CREEK.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 16, Tp. 11, Rge. 26, W. 3rd Mer., at the first highway bridge, north of the town of Maple Creek.

*Records available.*—May 13, 1908, to April 30, 1915.

*Gauge.*—Vertical staff. Zero of gauge was maintained at 2492.64 feet during 1908-09-10-11-14-15, and at 2492.71 during the years of 1912-13.

*Bench-mark.*—Permanent iron bench-mark. Elevation 2499.875 feet above sea level which is referred to the Geodetic Survey bench-mark No. 145c, on the northeast corner of the post office at Maple Creek, Sask., the elevation of which is 2510.39 feet above mean sea level.

*Channel.*—Composed of sand and may shift during flood stages.

*Discharge measurements.*—Made from the bridge by wading or with a weir.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—Miss Kate Williams.

*Remarks.*—Gauge height records were discontinued May 1, as it was considered that the records were not of sufficient value to warrant the expense of keeping two stations so close together on Maple creek. Records are available at the lower station.

## DISCHARGE MEASUREMENTS of Maple Creek at Maple Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 22.....	J. E. Caughey.....	36	39.0	0.70	2.85	28.0
Mar. 31.....	do.....	12	13.0	0.70	1.84	9.2
April 5.....	do.....	41	83.5	1.12	3.46	94.0
April 9.....	do.....	34	42.6	0.75	2.36	32.0
April 15.....	do.....	19	19.6	0.80	1.96	15.8



## DAILY GAUGE HEIGHT AND DISCHARGE of Maple Creek at Maple Creek, for 1915.

DAY.	March.		April.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.28 <sup>b</sup>	25.00
2.....			2.59	38.00
3.....			4.52	186.00
4.....			4.18	155.00
5.....			3.46	93.00
6.....			3.60	104.00
7.....			3.43	90.00
8.....			3.38	87.00
9.....			3.28	80.00
10.....			3.00	61.00
11.....			2.16	21.00
12.....			2.19	22.00
13.....			2.09	18.70
14.....			1.80	11.00
15.....			1.00	0.70
16.....			1.00	0.70
17.....	1.60 <sup>a</sup>	7.0	1.20	2.00
18.....	1.70	9.0	1.26	2.60
19.....	2.42	31.0	1.29	2.90
20.....	2.70	44.0	1.32	3.20
21.....	2.01	16.0	1.34	3.40
22.....	2.90	55.0	1.37	3.70
23.....	3.80	121.0	1.39	3.90
24.....	3.90	130.0	1.39	3.90
25.....	3.00	61.0	1.20	2.00
26.....	2.85	52.0	1.13	1.46
27.....	2.70	44.0	1.13	1.46
28.....	2.52	35.0	1.13	1.46
29.....	2.48	33.0	1.15	1.60
30.....	2.20	22.0	1.15	1.60 <sup>c</sup>
31.....	1.96	14.5		

<sup>a</sup> Creek started to run March 17.<sup>b</sup> Gauge height interpolated.<sup>c</sup> Station discontinued April 30.

## MONTHLY DISCHARGE of Maple Creek at Maple Creek, for 1915.

(Drainage area 81 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (17-31).....	130.0	Nil.	22.0	0.269	0.31	1,340
April.....	186.0	1.46	34.0	0.420	0.47	2,023
The period.....					0.78	3,363

## MAPLE CREEK NEAR MAPLE CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 28, Tp. 11, Rge. 26. W. 3rd Mer.*Records available.*—May 4, 1910, to October 31, 1915.*Gauge.*—Vertical staff. Zero of gauge was maintained at 81.64 feet during 1910-11; 81.60 feet during 1912-15.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Channel.*—Composed of sand, and liable to shift during floods.*Discharge measurements.*—Made with cable and weights from bridge, or by wading or with a weir for low stages.

## SESSIONAL PAPER No. 25c

*Artificial control.*—On May 28 a control was built fifty feet below the gauge at this station consisting of timbers jointed so as to form a V notch weir faced on the upstream side with board piling, and securely anchored to the bed of the stream and banks by posts.

*Winter flow.*—Station discontinued during the winter season.

*Observer.*—Miss Kate Williams.

## DISCHARGE MEASUREMENTS of Maple Creek near Maple Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 22.....	J. E. Caughey.....	62	25.4	1.12	6.21	82.00
Mar. 31.....	do.....	12	6.1	0.65	3.10	4.00
April 5.....	do.....	42	98.8	0.87	3.24	86.00
April 8.....	do.....	29	30.0	1.18	4.19	36.00
April 15.....	do.....	24	21.0	0.91	3.79	19.00
May 29.....	H. W. Rowley.....	<i>b</i>			3.14 <sub>a</sub>	0.88
June 7.....	R. J. McGuinness.....	35	60.2	0.55	4.46	34.00
June 11.....	H. W. Rowley.....	11	5.9	0.75	3.37	4.40
July 2.....	do.....	<i>b</i>			3.20	0.16
July 13.....	do.....	12	11.0	1.10	3.72	12.10
July 27.....	do.....	9	9.4	1.00	3.56	9.40
Aug. 25.....	do.....	<i>b</i>			3.06	0.41
Sept. 17.....	do.....	<i>b</i>			3.10	0.42
Oct. 14.....	do.....	<i>b</i>			3.09	0.30
Nov. 2.....	do.....	<i>b</i>			3.06	0.19

*a* Artificial control constructed 50 feet below gauge May 28th.

*b* Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Maple Creek near Maple Creek, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			3.48 <sub>c</sub>	10.10	2.68	1.12	3.19 <sub>c</sub>	1.39
2.....			3.83	20.00	2.68	1.12	3.47 <sub>c</sub>	6.70
3.....			5.93	120.00	2.65	1.00	3.75 <sub>c</sub>	13.00
4.....			5.83	116.00	2.63	0.92	4.02 <sub>c</sub>	19.90
5.....			4.94	71.00	2.63	0.92	4.30	28.00
6.....			4.80	64.00	2.64	0.96	4.27	27.00
7.....			4.63	56.00	2.64	0.96	4.21	25.00
8.....			4.41	46.00	2.64	0.96	4.16	24.00
9.....			4.33	42.00	2.64	0.96	3.76	13.20
10.....			4.26	39.00	2.63	0.92	3.57 <sub>c</sub>	8.80
11.....			4.12	33.00	2.63	0.92	3.38	4.80
12.....			3.85	21.00	2.64	0.96	3.33	3.80
13.....			3.81	19.80	2.78 <sub>c</sub>	1.52	3.34	4.00
14.....			3.74	17.40	2.92 <sub>c</sub>	2.20	3.36	4.40
15.....			3.77	18.40	3.06 <sub>c</sub>	3.40	3.36	4.40
16.....			3.50	10.50	3.19	4.90	3.36	4.40
17.....			3.46	9.70	3.39	8.20	3.39	5.00
18.....			3.40	8.40	3.50	10.50	3.39	5.00
19.....			3.20	5.00	2.88	2.00	3.38 <sub>c</sub>	4.80
20.....			3.10	3.80	2.91	2.20	3.37	4.60
21.....	6.34 <sub>a</sub>	88	3.00	2.80	2.88	2.00	3.33	4.20
22.....	6.25	84	2.80	1.60	2.80	1.60	3.33	4.20
23.....	6.04	111	2.50	0.60	2.80	1.60	3.33	3.80
24.....	6.63	118	2.02	0.00	2.78	1.52	3.33	3.80
25.....	6.36	114	2.60	0.80	2.75	1.40	3.33 <sub>a</sub>	3.80
26.....	6.00	104	2.80	1.60	2.71	1.24	3.30 <sub>c</sub>	3.20
27.....	5.63	94	2.80	1.60	2.90	2.10	3.30	3.20
28.....	5.45	92	2.80 <sub>c</sub>	1.60	3.15	4.40	3.30	3.20
29.....	5.14	83	2.79	1.56	3.17	1.18	3.32	3.60
30.....	4.63	56	2.70	1.20	3.19	1.39	3.32	3.60
31.....	3.14 <sub>b</sub>	4			3.19	1.39		

*a* to *b* Shifting ice conditions.

*c* Gauge height interpolated.

DAILY GAUGE HEIGHT AND DISCHARGE of Maple Creek near Maple Creek, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	3.32	3.60	3.04	0.29	3.08	0.38	3.01	0.22
2.....	3.33	3.80	3.04	0.29	3.08	0.38	3.01	0.22
3.....	3.33	3.80	3.04	0.29	3.08	0.38	3.01	0.22
4.....	3.30	3.20	3.04	0.29	3.11	0.53	3.01	0.22
5.....	3.30	3.20	3.04	0.29	3.20	1.50	3.04	0.29
6.....	3.35 <sup>a</sup>	4.20	3.04	0.29	3.25 <sup>a</sup>	2.40	3.02	0.24
7.....	3.40	5.20	3.04	0.29	3.31	3.40	3.02 <sup>a</sup>	0.24
8.....	4.70 <sup>a</sup>	43.00	3.03	0.29	3.20 <sup>a</sup>	1.50	3.01	0.22
9.....	6.00	103.00	3.03	0.27	3.08	0.38	3.01	0.22
10.....	5.60	83.00	3.03	0.27	3.04	0.29	3.10	0.42
11.....	5.38	72.00	3.03	0.27	3.02	0.24	3.10	0.42
12.....	4.10	22.00	3.02	0.24	3.02	0.24	3.10	0.42
13.....	3.72	12.30	3.02	0.24	3.03	0.27	3.10	0.42
14.....	4.11 <sup>a</sup>	22.00	3.01	0.22	3.05	0.31	3.09	0.40
15.....	4.50	35.00	3.03	0.27	3.07	0.35	3.10	0.42
16.....	4.07	21.00	3.03	0.27	3.09	0.40	3.10	0.42
17.....	4.00	19.40	3.03	0.27	3.10	0.42	3.10	0.42
18.....	3.60	9.50	3.03	0.27	3.08	0.38	3.10	0.42
19.....	3.50	7.30	3.03	0.27	3.04	0.29	3.10	0.42
20.....	3.72	12.30	3.03	0.27	3.03	0.27	3.10	0.42
21.....	3.50	7.30	3.05	0.31	3.01	0.22	3.10	0.42
22.....	3.50	7.30	3.05	0.31	3.01	0.22	3.10	0.42
23.....	3.60	9.50	3.05	0.31	3.01	0.22	3.10	0.42
24.....	3.70	11.80	3.05	0.31	3.01	0.22	3.10	0.42
25.....	3.50	7.30	3.06	0.33	3.01	0.22	3.10	0.42
26.....	3.50	7.30	3.07	0.35	3.01	0.22	3.10	0.42
27.....	3.56	8.60	3.07	0.35	3.01	0.22	3.10	0.42
28.....	3.40	5.20	3.07	0.35	3.01	0.22	3.10	0.42
29.....	3.04	0.29	3.07	0.35	3.01	0.22	3.10	0.42
30.....	3.04	0.29	3.07	0.35	3.01	0.22	3.10	0.42
31.....	3.04	0.29	3.07	0.35			3.10	0.42

<sup>a</sup> Gauge height interpolated.

## MONTHLY DISCHARGE of Maple Creek near Maple Creek, for 1915.

(Drainage area 82 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (21-31).....	118.00	4.00	86.00	1.05000	0.4300	1,880
April.....	120.00	Nil.	25.00	0.30500	0.3400	1,488
May.....	10.50	0.92	2.10	0.02560	0.0300	129
June.....	28.00	1.39	8.30	0.10100	0.1100	494
July.....	103.00	0.29	17.90	0.22000	0.2500	1,101
August.....	0.35	0.22	0.29	0.00354	0.0040	18
September.....	3.40	0.22	0.55	0.00671	0.0075	33
October.....	0.42	0.22	0.36	0.00439	0.0050	22
The period.....					1.1765	5,165

## MAPLE CREEK AT DIXON'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 5, Tp. 12, Rge. 26, W. 3rd Mer., at Joseph Dixon's ranch, four miles north and one mile west of the town of Maple Creek.

*Records available.*—May 1 to October 31, 1915.

*Gauge.*—Vertical staff nailed to a 4-inch x 4-inch post driven into the bed of the stream near the right bank and braced by two 2-inch x 4 inch to the right bank, 150 feet upstream from the natural rock control and trail crossing. Zero elevation maintained at 89.82 feet since establishment.

## SESSIONAL PAPER No. 25c

*Bench-mark.*—Permanent iron bench-mark forty feet west of gauge rod. Assumed elevation 100.00 feet.

*Channel.*—Practically permanent, channel at all stages composed of clay and rock.

*Discharge measurements.*—Made by wading or from highway bridge three-quarters of a mile upstream during flood stages.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—Miss Agnes Dixon.

## DISCHARGE MEASUREMENTS of Maple Creek at Dixon's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 28	J. E. Caughey	6.2	3.82	2.82	1.92	10.80
May 4	H. W. Rowley	5.7	1.94	1.42	1.77	2.70
May 29	do	7.0	3.00	1.65	1.84	5.00
June 7	R. J. McGuinness	32.0	93.87	1.94	3.40	182.00
June 11	H. W. Rowley	20.0	1.97	1.28	2.25	25.00
July 2	do	6.0	2.70	1.50	1.55	4.00
July 13	do	19.0	17.80	1.14	2.17	20.00
July 27	do	20.0	18.80	1.10	2.20	21.00
Aug. 25	do	a			1.69	0.48
Sept. 16	do	a			1.68	0.67
Oct. 14	do	a			1.81	3.20
Nov. 2	do	a			1.68	0.68

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Maple Creek at Dixon's Ranch, for 1915.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	1.89	5.9	1.84	4.5	1.86 <sub>a</sub>	5.0	2.13 <sub>a</sub>	17.20	1.53	0.09	1.74	2.20
2.	1.88	5.6	1.85	4.8	1.86	5.0	2.01	10.70	1.68	1.18	1.78	2.90
3.	1.82 <sub>a</sub>	3.9	2.35	32.0	1.84	4.5	2.00	10.20	1.80	3.30	1.82	3.90
4.	1.77	2.7	4.00	386.0	1.83	4.2	1.97	9.00	1.75	2.40	1.82	3.90
5.	1.76	2.5	4.56	576.0	1.81	3.6	1.87	5.30	1.75	2.40	1.77	2.70
6	1.75	2.4	3.86	338.0	1.80	3.3	1.86	5.00	1.74	2.20	1.80	3.30
7	1.75	2.4	3.84	332.0	1.81	3.6	1.85	4.80	1.73	2.00	1.82	3.90
8	1.75	2.4	2.69	59.0	1.91	6.6	1.78	2.90	1.71	1.59	1.78	2.90
9	1.74	2.2	2.56	48.0	3.05	102.0	1.77	2.70	1.71	1.59	1.80	3.30
10	1.73	2.0	2.40	35.0	2.35	32.0	1.76	2.50	1.64	0.74	1.79	3.10
11	1.73	2.0	2.24	24.0	2.37	33.0	1.76	2.50	1.64	0.74	1.78	2.80
12	1.70	1.4	2.28	27.0	2.47	41.0	1.76	2.50	1.64	0.74	1.76	2.50
13	1.70	1.4	2.12	16.6	2.17	19.7	1.77 <sub>a</sub>	2.70	1.65	0.85	1.75	2.40
14	1.80	3.3	2.10	15.4	3.25	111.0	1.78	2.90	1.66	0.96	1.81	3.90
15	1.94	7.8	2.05	12.8	3.27	146.0	1.78	2.90	1.65	0.85	1.80	3.90
16	2.94	86.0	2.02 <sub>a</sub>	11.2	2.81	71.0	1.77	2.70	1.68	1.18	1.80	3.90
17	3.95	309.0	2.00	10.2	2.47	41.0	1.78	2.90	1.65	0.85	1.79	2.40
18	3.10 <sub>a</sub>	110.0	1.96	8.6	2.25	25.0	1.79	3.10	1.64	0.74	1.72	1.78
19	2.25	25.0	1.98	9.4	2.45	39.0	1.79 <sub>a</sub>	3.10	1.65	0.85	1.74	2.20
20	2.24	24.0	1.97	9.0	2.55	47.0	1.79	3.10	1.65	0.85	1.75	2.40
21	2.08	11.4	2.00	10.2	2.35	32.0	1.72 <sub>a</sub>	1.78	1.66	0.96	1.74	2.20
22	1.95	8.2	2.03	12.8	2.20 <sub>a</sub>	22.0	1.65	0.85	1.65	0.85	1.72	2.00
23	1.93	7.4	2.06	13.3	2.05	12.8	1.65	0.85	1.65	0.85	1.72	1.78
24	1.90	6.2	1.99	9.8	3.30	153.0	1.65 <sub>a</sub>	0.85	1.64	0.74	1.70	1.40
25	1.85	4.8	1.94 <sub>a</sub>	7.8	2.75	65.0	1.65	0.85	1.64	0.74	1.66	0.96
26	1.84 <sub>a</sub>	4.5	1.90	6.2	2.45	39.0	1.64	0.74	1.65	0.85	1.67	1.07
27	1.81	4.5	1.89	5.0	2.20	22.0	1.60	0.30	1.65	0.85	1.68	1.18
28	1.82	3.9	1.85	4.8	2.15	18.4	1.58	0.24	1.66	0.96	1.67	1.07
29	1.81	4.5	1.85	4.8	2.05	12.8	1.54	0.12	1.69	1.29	1.70	1.40
30	1.82	3.9	1.87	5.3	2.25	25.0	1.54	0.12	1.72	1.78	1.69	0.96
31	1.81	3.6			2.25	25.0	1.55	0.11			1.69	0.96

a Gauge height interpolated.

## MONTHLY DISCHARGE of Maple Creek at Dixon's Ranch, for 1915.

(Drainage area 375 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May.....	369.00	1.40	24.00	0.06400	0.070	1,476
June.....	576.00	4.50	68.00	0.18200	0.200	4,046
July.....	153.00	3.30	39.00	0.10400	0.120	2,398
August.....	17.20	0.12	3.40	0.00907	0.010	209
September.....	3.30	0.09	1.20	0.00320	0.004	71
October.....	3.90	0.96	2.40	0.00640	0.007	148
The period.....					0.411	8,348

## DIXON DITCH FROM MAPLE CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 17, Tp. 12, Rge. 26, W. 3rd Mer.

*Gauge.*—Vertical staff, situated at the headgate. Zero elevation maintained at 95.88 feet since establishment.

*Bench-mark.*—On top of wooden plug used as I. P. of soundings about 190 feet north of headgate. Assumed elevation, 100.00 feet.

*Channel.*—One channel, clay bed.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—Jos. Dixon.

*Remarks.*—This station was established on June 4, 1911, by H. M. Goodman. Water was used in irrigation season of 1915, but no records were obtained.

## MANY ISLAND LAKE DRAINAGE BASIN.

*General Description.*

Many Island Lake is about twenty-five square miles in area, and is situated on the boundary line between the provinces of Alberta and Saskatchewan, about ten miles north of the town of Walsh. It is the farthest west of the several lakes which receive the drainage of the northern slope of the Cypress Hills. The lake is shallow and alkaline. Its only source of water supply is Mackay Creek with its tributaries, Stony and Boxelder Creeks.

The topography of the basin is very rough, and the creek slopes are heavy. The basin is bare of trees except in the hills near the sources of the streams. The creek channels are deep, and the beds are mostly gravel.

As is the case in all prairie basins, the highest discharges occur in April. All the streams of this drainage basin stop running in June or July and generally remain so for the remainder of the season.

In the lower part of the drainage basin near the lake, irrigation has been developed to some extent in hay meadows. In the upper part there are few irrigation schemes.

## EAST BRANCH MACKAY CREEK AT GRANT'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 36, Tp. 10, Rge. 1, W. 4th Mer., at Arthur Grant's ranch.

*Records available.*—From October 13, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. The zero of the gauge was maintained at 75.65 feet during 1911; the zero of the gauge was maintained at 75.85 feet during 1912-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Practically permanent.

*Discharge measurements.*—Made by wading or with a weir.

*Winter flow.*—Station discontinued during winter season.

*Remarks.*—Gauge height records were discontinued during 1915, as it was considered they were not of sufficient value to warrant the expense of maintenance.



Mackay Creek in flood at Walsh, Alberta, on June 4, 1915. Taken by Miss H. E. Inkster.



Mackay Creek in flood at Walsh, Alberta, on June 4, 1915. Taken by Miss H. E. Inkster.





## SESSIONAL PAPER No. 25c

DISCHARGE MEASUREMENTS of East Branch of Mackay Creek at Grant's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Oct. 13.....	H. W. Rowley.....				1.10	Nil.

## WEST BRANCH MACKAY CREEK AT SCHNELL'S RANCH.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 27, Tp. 10, Rge. 1, W. 4th Mer., at Chris. Schnell's ranch.*Records available.*—From Sept. 20, 1912, to October 31, 1914.*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 91.66 feet, remaining unchanged since the station was established.*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.*Channel.*—Composed of loose stones and gravel liable to shift during flood stages.*Discharge measurements.*—Made by wading or with a weir.*Winter flow.*—Station discontinued during the winter season.*Remarks.*—Gauge height records were discontinued during 1915, as it was considered they were not of sufficient value to warrant the expense of maintenance.

## DISCHARGE MEASUREMENTS of West Branch of Mackay Creek at Schnell's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Oct. 13.....	H. W. Rowley.....				Dry.	Nil.

## MACKAY CREEK AT WALSH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 26, Tp. 11, Rge. 1, W. 4th Mer., at traffic bridge.*Records available.*—July 29, 1909, to October 31, 1915.*Gauge.*—Vertical staff. Elevation 2432.65 feet above mean sea level, maintained since establishment.*Bench-mark.*—Permanent iron bench-mark. Elevation 2443.73 feet above mean sea level. (Geodetic Survey of Canada.)*Channel.*—Composed of clay.*Discharge measurements.*—Made from bridge, wading or with a weir.*Floods.*—On June 4, 1915, this stream slightly overflowed its banks at the town of Walsh, but caused little damage. This rise was due to excessive rainfall during the last of May and the early part of June at the headwaters.*Winter flow.*—Station not maintained during winter.*Observer.*—Edward Sept.

DISCHARGE MEASUREMENTS of Mackay Creek at Walsh, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 17.....	R. J. Srigley.....	57.0	203.00	1.44	5.20	294.00
April 2.....	H. B. R. Thompson.....	29.0	38.00	0.87	1.81	33.00
April 8.....	do.....	17.0	32.45	0.91	1.72	29.00
April 19.....	do.....	11.6	10.92	0.71	0.94	7.70
May 3.....	H. W. Rowley.....	<i>a</i>			0.36	0.50
June 6.....	R. J. McGuinness.....	60.0	245.50	1.42	5.65	347.00
June 6.....	do.....	<i>b</i>	595.30		10.94	
June 11.....	H. W. Rowley.....	12.0	27.40	1.05	1.72	29.00
July 2.....	do.....	6.0	5.40	0.46	0.66	2.50
July 20.....	H. B. R. Thompson.....	11.0	18.27	0.50	0.97	9.20
July 26.....	H. W. Rowley.....	8.0	8.60	1.09	1.05	9.40
Aug. 24.....	do.....	<i>a</i>			0.56	1.27
Sept. 15.....	do.....	<i>a</i>			0.32	0.16
Oct. 13.....	do.....	8.0	7.70	0.48	0.74	3.70
Nov. 1.....	do.....	<i>a</i>			0.57	1.66

*a* Weir measurement.  
*b* Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Mackay Creek at Walsh, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.55	24.00	0.44	0.70	0.60	1.90
2.....			1.97	38.00	0.40	0.50	0.68	2.80
3.....			3.90	158.00	0.35	0.35	1.78	32.00
4.....			4.24	189.00	0.30	0.20	8.84	1,009.00
5.....			2.62	68.00	0.24	0.11	7.44	663.00
6.....			2.06	42.00	0.22	0.08	5.79	369.00
7.....			1.80	32.00	0.30	0.20	3.38	118.00
8.....			1.73	30.00	0.28	0.17	2.61	68.00
9.....			1.62	26.00	0.24	0.11	2.10	44.00
10.....			1.36	18.70	0.17	Nil.	1.84	34.00
11.....			1.31	17.30	0.09	"	1.72	30.00
12.....			1.25	15.60	0.04	"	1.66	28.00
13.....			1.27	16.20	0.00	"	1.56	25.00
14.....			1.35	18.40	0.07	"	1.44	21.00
15.....			1.38	19.20	0.97	8.10	1.30	17.00
16.....	2.20	48.0	1.32	17.60	4.43	207.00	1.18	13.70
17.....	4.55	219.0	1.10	11.50	2.82	80.00	1.12	12.00
18.....	4.69	234.0	1.08	11.00	1.85	34.00	1.12	12.00
19.....	2.78	78.0	0.94	7.50	1.45	21.06	1.23	15.00
20.....	2.34	54.0	0.90	6.60	1.26	15.90	1.21	14.50
21.....	2.63	69.0	0.82	5.00	1.11	11.80	1.19	13.90
22.....	3.84	153.0	0.76	4.00	1.01	9.10	1.08	11.00
23.....	4.02	169.0	0.73	3.50	0.98	8.40	0.98	8.40
24.....	3.12	99.0	0.72	3.30	0.92	7.00	0.89	6.40
25.....	1.78	32.0	0.70	3.00	0.86	5.80	0.78	4.30
26.....	1.54	24.0	0.68	2.80	0.85	5.60	1.34	18.10
27.....	1.80	32.0	0.62	2.10	0.94	7.50	0.90	6.60
28.....	1.76	31.0	0.54	1.36	0.90	6.60	0.90	6.60
29.....	1.77	31.0	0.54	1.36	0.80	4.60	0.80	4.60
30.....	1.52	23.0	0.50	1.00	0.72	3.30	0.76	4.00
31.....	1.10	11.5			0.65	2.40		

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DAILY GAUGE HEIGHT AND DISCHARGE of Mackay Creek at Walsh, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.71	3.2	0.62	2.10	0.01	Nil.	Dry.	Nil.
2.....	0.65	2.4	0.56	1.54	Dry.	"	"	"
3.....	0.70	3.0	0.51	1.09	"	"	"	"
4.....	0.69	2.9	0.46	0.80	"	"	0.42	0.60
5.....	0.68	2.8	0.37	0.41	0.22	0.08	0.30	0.20
6.....	0.62	2.1	0.22	0.08	0.25	0.13	0.56	1.54
7.....	1.44	21.0	0.16	Nil.	0.18	Nil.	0.56	1.54
8.....	1.66	28.0	0.08	"	0.13	"	0.69	2.60
9.....	1.81	33.6	0.02	"	0.30	0.20	0.69	2.90
10.....	1.06	10.4	Dry.	"	0.23	0.09	0.66	2.60
11.....	0.84	5.4	"	"	0.17	Nil.	0.73	3.50
12.....	0.72	3.3	"	"	0.12	"	0.70	3.00
13.....	0.70	3.0	"	"	0.32	0.26	0.71	3.20
14.....	2.08	43.0	"	"	0.41	0.55	0.65	2.80
15.....	3.10	98.0	"	"	0.33	0.29	0.66	2.60
16.....	1.88	35.0	"	"	0.30	0.20	0.63	2.20
17.....	1.44	21.0	3.44	122.00	0.25	0.13	0.60	1.90
18.....	1.22	14.8	1.00	8.80	0.19	Nil.	0.58	1.72
19.....	1.10	11.5	0.74	3.60	0.18	"	0.58	1.72
20.....	0.97	8.1	0.56	1.54	0.43	0.65	0.57	1.63
21.....	0.85	5.6	0.50	1.00	0.29	0.18	0.52	1.18
22.....	0.78	4.3	1.00	8.80	0.23	0.09	0.51	1.09
23.....	0.72	3.3	0.72	3.30	0.18	Nil.	0.50	1.00
24.....	1.92	36.0	0.55	1.45	0.16	"	0.50	1.00
25.....	1.33	17.8	0.48	0.90	0.14	"	0.50	1.00
26.....	1.10	11.5	0.40	0.50	0.12	"	0.48	0.90
27.....	0.91	6.8	0.34	0.32	0.08	"	0.48	0.90
28.....	0.82	5.0	0.31	0.23	0.06	"	0.48	0.90
29.....	0.70	3.0	0.22	0.08	0.02	"	0.48	0.90
30.....	0.67	2.7	0.14	Nil.	0.05	"	0.48	0.90
31.....	0.66	2.6	0.05	"	"	"	0.48	0.90

## MONTHLY DISCHARGE of Mackay Creek at Walsh, for 1915.

(Drainage area 200 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
March (16-31).....	231.00	11.50	82.00	0.41000	0.2400	2,591
April.....	180.00	1.00	25.00	0.13000	0.1400	1,347
May.....	207.00	0.00	14.20	0.07100	0.0800	874
June.....	1,009.00	1.90	87.00	0.43000	0.4800	5,177
July.....	98.00	2.10	14.50	0.07250	0.0800	892
August.....	122.00	0.00	5.10	0.02500	0.0100	314
September.....	0.65	0.00	0.10	0.00048	0.0005	6
October.....	3.50	0.00	1.52	0.00760	0.0090	93
The period.....					1.0595	11,492

## BOXELDER CREEK AT YOUNG'S RANCH.

*Location.*—On the NE. 1/4 Sec. 2, Tp. 12, Rge. 30, W. 3rd Mer., two miles east of Walsh.  
*Records available.*—March 11, 1911, October 31, 1915. Discharge measurements only 1909-10.  
*Gauge.*—Vertical staff. Elevation of zero maintained at 88.83 feet since establishment.  
*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.  
*Channel.*—Clay.

Discharge Measurements.—Made by wading; during flood stages from railway bridge downstream.

Winter flow.—Station not maintained during the winter.

Observer.—John Young.

Remarks.—On October 14, the gauge rod at this station was moved two hundred feet downstream. There was no flow in the creek after the rod was moved.

DISCHARGE MEASUREMENTS of Boxelder Creek at Young's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Fl. per sec.	Feet.	Sec.-ft.
Mar. 17	R. J. Srigley	38.00	91.40	0.79	4.30	72.00
April 2	H. B. R. Thompson	11.90	8.80	0.53	1.70	4.70
April 8	do	12.00	11.90	0.82	1.90	9.70
April 19	do	9.00	3.71	0.25	1.34	0.94
May 3	H. W. Rowley				Dry.	Nil.
June 6	R. J. McGuinness	47.00	160.30	0.71	5.83	114.00
June 6	do		234.60	0.96	7.27	225.00
June 11	H. W. Rowley	10.00	7.60	0.46	1.63	3.50
July 2	do				Dry.	Nil.
July 20	H. B. R. Thompson				0.74	
July 27	H. W. Rowley	4.00	2.40	1.04	1.54	2.50
Aug. 24	do				Dry.	Nil.
Sept. 16	do				"	"
Oct. 14	do				"	"
Nov. 2	do				"	"

a Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Boxelder Creek at Young's Ranch, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.65	3.8	Dry.	Nil.	Dry.	Nil.
2			1.90	8.5	"	"	"	"
3			3.20	40.0	"	"	3.75	55.00
4			3.95	60.0	"	"	5.00	89.00
5			3.60	51.0	"	"	6.90	165.00
6			2.65	26.0	"	"	6.02	121.00
7			1.95	9.6	"	"	4.05	63.00
8			1.90	8.5	"	"	2.15	14.20
9			1.90	8.5	"	"	1.92	8.90
10			1.75	5.5	"	"	1.70	4.50
11			1.70	4.5	"	"	1.62	3.50
12			1.60	3.2	"	"	1.50	2.00
13			1.60	3.2	"	"	1.50	2.00
14			1.60	3.2	"	"	1.48	1.80
15			1.60	3.2	"	"	1.40	1.00
16	3.95	60.0	1.50	2.0	1.10	"	1.38	0.88
17	4.45	74.0	1.50	2.0	3.25	41.0	1.28	0.36
18	5.85	115.0	1.50	2.0	2.25	16.5	1.20	0.20
19	3.70	53.0	1.50	2.0	1.50	2.0	1.20	0.20
20	2.85	31.0	1.50	2.0	1.30	0.4	1.22	0.24
21	2.85	31.0	1.48	1.8	1.25	0.3	1.30	0.40
22	3.15	39.0	1.40	1.0	1.20	0.2	1.25	0.30
23	3.20	40.0	0.95	Nil.	1.10	Nil.	1.10	Nil.
24	3.75	55.0	0.65	"	1.05	"	1.00	"
25	2.85	31.0	0.45	"	0.95	"	0.92	"
26	2.20	15.3	0.35	"	0.85	"	1.20	0.20
27	1.80	6.5	0.15	"	0.60	"	1.48	1.80
28	1.65	3.8	Dry.	"	0.50	"	1.20	0.20
29	1.60	3.2	"	"	0.40	"	0.85	Nil.
30	1.65	3.8	"	"	Dry.	"	0.50	"
31	1.48	1.8	"	"				

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Boxelder Creek at Young's Ranch, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	0.40	Nil.	0.75	Nil.	Dry.	Nil.	Dry.	Nil.
2.....	0.38	"	0.42	"	"	"	"	"
3.....	0.30	"	0.30	"	"	"	"	"
4.....	0.15	"	0.15	"	"	"	"	"
5.....	Dry.	"	Dry.	"	"	"	"	"
6.....	"	"	"	"	"	"	"	"
7.....	"	"	"	"	"	"	"	"
8.....	"	"	"	"	"	"	"	"
9.....	"	"	"	"	"	"	"	"
10.....	"	"	"	"	"	"	"	"
11.....	"	"	"	"	"	"	"	"
12.....	"	"	"	"	"	"	"	"
13.....	"	"	"	"	"	"	"	"
14.....	"	"	"	"	"	"	"	"
15.....	"	"	"	"	"	"	"	"
16.....	1.75	5.50	"	"	"	"	"	"
17.....	1.65	3.80	"	"	"	"	"	"
18.....	1.25	0.30	"	"	"	"	"	"
19.....	1.20	0.20	"	"	"	"	"	"
20.....	1.05	Nil.	"	"	"	"	"	"
21.....	0.80	"	"	"	"	"	"	"
22.....	0.50	"	"	"	"	"	"	"
23.....	0.32	"	"	"	"	"	"	"
24.....	1.98	10.20	"	"	"	"	"	"
25.....	2.40	20.00	"	"	"	"	"	"
26.....	1.80	6.50	"	"	"	"	"	"
27.....	1.42	1.20	"	"	"	"	"	"
28.....	1.30	0.40	"	"	"	"	"	"
29.....	1.30	0.40	"	"	"	"	"	"
30.....	1.15	0.10	"	"	"	"	"	"
31.....	0.95	Nil.	"	"	"	"	"	"

## MONTHLY DISCHARGE of Boxelder Creek at Young's Ranch, for 1915.

(Drainage area 104 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet
March (16-31).....	115.00	1.80	35.00	0.3380	0.20	1,117
April.....	60.00	0.00	8.40	0.0808	0.09	500
May.....	41.00	0.00	1.95	0.0188	0.02	120
June.....	165.00	0.00	17.80	0.0171	0.20	1,065
July.....	20.00	0.00	1.58	0.0152	0.02	97
August.....						Nil.
September.....						"
October.....						"
The period.....					0.53	2,899

## ROSS CREEK DRAINAGE BASIN.

*General Description.*

Ross Creek rises in Elkwater Lake, a small body of water covering an area of approximately two square miles, situated in Township 8, Range 3, West of the 3rd Meridian. The creek flows in a northerly direction as far as Irvine and then turns sharply to the westward and closely parallels the main line of the Canadian Pacific railway to Medicine Hat. Here it joins Sevenpersons River and the combined stream flows into the South Saskatchewan in Section 32, Township 12, Range 5, West of the 4th Meridian. The tributaries of Ross Creek are Bullshead Creek which joins it in Section 21, Township 12, Range 5, West of the 4th Meridian and Grosventre Creek joins it in Section 14, Township 11, Range 3, West of the 4th Meridian.

The topography of this basin is exceedingly rough and rolling, and almost totally devoid of tree growth. The one exception is a small area of the Forest Reserve just south of Elkwater Lake, which has a good stand of pine and spruce.

The Canadian Pacific railway takes the water supply for its tank at Irvine from Ross Creek and there are also several irrigation schemes taking their supply from this stream.

## ROSS CREEK AT KOENIG'S RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 36, Tp. 9, Rge. 3, W. 4th Mer., at G. Koenig's ranch, one mile below the former station on Ross Creek at James Robinson's ranch.

*Records available.*—At the original station at Robinson's ranch, NW.  $\frac{1}{4}$  Sec. 24, Tp. 9, Rge. 3, W. 4th Mer., from October 11, 1911, to May 6, 1914; at the new station established May 15, 1914, at Koenig's ranch, SE.  $\frac{1}{4}$  Sec. 36, Tp. 9, Rge. 3, W. 4th Mer., from May 15 to October 31, 1914. No records obtained in 1915.

## MISS A. H. BROWN'S DITCH NEAR EAGLE BUTTE.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 31, Tp. 8, Rge. 3, W. 4th Mer., about one-quarter mile downstream from dam.

*Records available.*—None. Station established too late in season to obtain records for 1915.

*Gauge.*—Vertical staff driven into the bed of the ditch near the left bank. Zero elevation maintained at 95.93 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark located on the left bank four feet from the gauge rod. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gravel loam.

*Discharge measurements.*—Made with meter or weir.

*Observer.*—L. C. Brown.

*Remarks.*—This station was established October 14, 1915, by H. R. Carscallen.

## GROSVENTRE CREEK AT TOTHILL'S RANCH.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 27, Tp. 9, Rge. 4, W. 4th Mer., at Alf. Tothill's ranch.

*Records available.*—October 10, 1911, to April 23, 1915.

*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 82.89 feet since the station was established.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Practically permanent.

*Observer.*—Mrs. Kate Tothill.

*Remarks.*—Gauge height observations were discontinued April 23, 1915, as they were not considered of sufficient value to warrant the expense of maintenance.

## DISCHARGE MEASUREMENTS of Grosventre Creek at Tothill's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 9.....	H. W. Rowley.....	.....a	.....	.....	0.62	0.76
Oct. 9.....	do .....	.....a	.....	.....	0.53	0.20

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Grosventre Creek at Tothill's Ranch, for 1915.

DAY.	March.		April.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			1.12	13.70
2.....			1.79	64.00
3.....			1.78	63.00
4.....			1.33	26.00
5.....			1.15	15.10
6.....			0.94	6.50
7.....			0.90	5.20
8.....			0.86	4.20
9.....			0.76	2.20
10.....			0.72	2.00
11.....			0.68	1.20
12.....			0.70	1.40
13.....	2.28	106.0a	0.72	1.66
14.....	2.06	87.0	0.74	1.92
15.....	2.15	95.0	0.70	1.40
16.....	1.67	53.0	0.66	1.00
17.....	1.43	33.0	0.63	0.74
18.....	1.39	30.0	0.60	0.50
19.....	1.50	39.0	0.56	0.30
20.....	1.50	39.0	0.52	0.16
21.....	1.84	68.0	0.50	0.10
22.....	2.27	105.0	0.52	0.16
23.....	2.08	89.0	0.51	0.13
24.....	1.33	26.0	b	
25.....	1.22	19.0		
26.....	1.04	10.1		
27.....	0.90	5.2		
28.....	1.00	8.5		
29.....	0.98	7.8		
30.....	0.89	4.9		
31.....	0.99	8.2		

a 1914 discharge curve used to obtain discharge for 1915.

b Station discontinued April 24.

## MONTHLY DISCHARGE of Grosventre Creek at Tothill's Ranch, for 1915.

(Drainage area 39 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (13-31).....	106.00	0.00	27.00	0.693	0.80	1,660
April (1-24).....	64.00	0.13	9.30	0.240	0.20	422
The period.....					1.00	2,082

## ROSS CREEK AT IRVINE.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 31, Tp. 14, Rge. 2, W. 4th Mer., at traffic bridge in town of Irvine, and about 400 yards below the Canadian Pacific Railway Company's dam.

*Records available.*—July 28, 1909, to October 31, 1914.

*Gauge.*—Staff. The elevation of the zero of the gauge, 2477.79 feet, has been unchanged since establishment.

*Bench-mark.*—Permanent iron bench-mark. Elevation, 2501.43 feet above mean sea level (Geodetic Survey.)



*Channel.*—Shifting.

*Discharge measurements.*—From traffic bridge, by wading or with weir.

*Winter flow.*—Observations discontinued during winter.

*Artificial control.*—Canadian Pacific Railway Company have a dam about 400 yards above station.

*Diversions.*—Canadian Pacific Railway Company pump water from creek above dam for their water tank at Irvine.

*Observer.*—H. J. Price.

### DISCHARGE MEASUREMENTS of Ross Creek at Irvine, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 18.	R. J. Srigley	44.5	164.0	1.81	6.94	297.00
April 3.	H. B. R. Thompson	41.0	150.0	1.75	6.20	262.00
April 8.	do	15.0	24.2	1.52	1.96	37.00
April 20.	do	12.0	5.4	0.76	1.13	6.40
June 6.	R. J. McGuinness	31.0	97.6	1.81	4.53	177.00
July 1.	W. H. Snelson	13.5	13.7	1.68	1.43	14.80
July 1.	do	13.5	13.6	1.19	1.45	16.10
July 20.	H. B. R. Thompson	10.0	12.5	0.80	1.24	10.00
Aug. 24.	H. W. Rowley	a			6.68	0.46
Sept. 15.	do				0.63	Nil.
Nov. 1.	Whyte and Rowley	a			0.80	0.95

a Weir measurement.

### DAILY GAUGE HEIGHT AND DISCHARGE of Ross Creek at Irvine, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.			4.16	156.00	0.90	2.30	1.04	4.7
2.			5.40	219.00	0.90	2.30	1.40	13.7
3.			6.32	268.06	0.90	2.30	2.90	86.0
4.			5.40	219.00	0.90	2.30	6.52	279.0
5.			4.20	155.00	0.87	1.94	5.40	219.0
6.			2.50	65.00	0.83	1.46	4.20	155.0
7.			2.01	40.00	0.80	1.10	3.50	118.0
8.			2.01	40.00	0.77	0.83	2.80	81.0
9.			1.90	34.00	0.73	0.47	2.70	76.0
10.			1.65	23.00	0.70	0.20	2.60	71.0
11.	0.07	Nil.	1.52	17.80	0.69	0.18	2.50	65.0
12.	0.84	1.58	1.46	15.90	0.69	0.18	2.00	39.0
13.	1.64	23.00	1.40	13.70	1.01	4.10	1.80	29.0
14.	2.20	54.00	1.40	13.70	1.95	36.00	1.60	21.0
15.	4.29	160.00	1.40	13.70	2.90	86.00	1.40	13.7
16.	5.94	248.00	1.36	12.50	3.25	105.00	2.00	39.0
17.	6.41	273.00	1.34	12.00	2.90	86.00	2.10	44.0
18.	7.14	312.00	1.27	9.80	1.90	34.00	2.00	39.0
19.	5.05	200.00	1.25	9.50	1.70	25.00	2.00	39.0
20.	3.14	99.00	1.13	6.60	1.50	17.00	1.50	17.0
21.	3.04	94.00	1.03	4.50	1.39	13.40	1.30	10.8
22.	6.13	259.00	1.02	4.30	1.37	12.80	1.30	10.8
23.	6.58	282.00	1.00	3.90	1.36	12.50	1.30	10.8
24.	5.14	205.00	0.98	3.60	1.33	11.70	1.30	10.8
25.	3.05	94.00	0.97	3.40	1.33	11.70	1.28	10.3
26.	2.06	42.00	0.95	3.10	1.30	10.80	1.28	10.3
27.	1.74	27.00	0.95	3.10	1.30	10.80	1.26	9.8
28.	1.94	36.00	0.95	3.10	1.04	4.70	1.22	8.7
29.	2.04	41.00	0.93	2.80	1.02	4.30	1.18	7.8
30.	2.10	44.00	0.90	2.30	1.00	3.90	1.14	6.8
31.	2.13	46.00			1.02	4.30		

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Ross Creek at Irvine, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.09	5.70	0.82	1.34	0.79	1.01	0.70	0.20
2.....	1.09	5.70	0.82	1.34	0.78	0.92	0.71	0.29
3.....	1.07	5.30	0.79	1.01	0.78	0.92	0.71	0.29
4.....	1.05	4.90	0.79	1.01	0.78	0.92	0.71	0.29
5.....	0.99	3.70	0.84	1.58	0.77	0.83	0.72	0.38
6.....	0.98	3.60	0.76	0.74	0.77	0.83	0.72	0.38
7.....	0.98	3.60	0.74	0.56	0.75	0.65	0.72	0.38
8.....	0.97	3.40	0.70	0.20	0.75	0.65	0.79	1.01
9.....	0.97	3.40	0.71	0.29	0.73	0.47	0.79	1.01
10.....	0.96	3.30	0.69	0.18	0.73	0.47	0.79	1.01
11.....	0.96	3.30	0.69	0.18	0.71	0.29	0.79	1.01
12.....	0.96	3.30	0.69	0.18	0.71	0.29	0.79	1.01
13.....	1.01	4.10	0.64	0.08	0.69	0.18	0.79	1.01
14.....	2.09	44.00	0.64	0.08	0.69	0.18	0.79	1.01
15.....	2.49	65.00	0.59	Nil.	0.69	0.18	0.79	1.01
16.....	3.29	107.00	0.59	"	0.69	0.18	0.79	1.01
17.....	3.24	104.00	2.03	40.00	0.69	0.18	0.79	1.01
18.....	3.09	96.00	2.07	43.00	0.69	0.18	0.79	1.01
19.....	1.99	38.00	1.99	38.00	0.69	0.18	0.79	1.01
20.....	1.49	16.70	1.59	21.00	0.69	0.18	0.79	1.01
21.....	1.24	9.20	2.97	90.00	0.69	0.18	0.79	1.01
22.....	1.19	8.00	2.39	60.00	0.69	0.18	0.79	1.01
23.....	1.19	8.00	1.97	38.00	0.69	0.18	0.79	1.01
24.....	1.14	6.80	1.58	20.00	0.69	0.18	0.79	1.01
25.....	1.09	5.70	0.89	2.10	0.69	0.18	0.79	1.01
26.....	1.09	5.70	0.84	1.58	0.69	0.18	0.79	1.01
27.....	0.99	3.70	0.81	1.22	0.69	0.18	0.79	1.01
28.....	0.94	2.90	0.81	1.22	0.69	0.18	0.79	1.01
29.....	0.89	2.10	0.81	1.22	0.69	0.18	0.79	1.01
30.....	0.89	2.10	0.81	1.22	0.69	0.18	0.79	1.01
31.....	0.84	1.58	0.81	1.22			0.79	1.01

## MONTHLY DISCHARGE of Ross Creek at Irvine, for 1915.

(Drainage area 248 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (11-31).....	312.00	Nil.	121.00	0.48860	0.380	5,039
April.....	268.00	2.30	46.00	0.18500	0.210	2,737
May.....	105.00	0.18	16.40	0.06610	0.080	1,008
June.....	279.00	4.70	52.00	0.20900	0.230	3,094
July.....	107.00	1.58	18.70	0.07540	0.090	1,150
August.....	90.00	0.00	11.90	0.04800	0.060	732
September.....	1.01	0.18	0.38	0.00153	0.002	23
October.....	1.01	0.20	0.84	0.00338	0.004	52
The period.....					1.056	13,835

## MRS. M. A. CLARK DITCH FROM BULLSHEAD CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 15, Tp. 9, Rge. 5, W. 4th Mer., 500 feet downstream from dam and intake of ditch.

*Gauge.*—Vertical staff fastened to post driven into bed of ditch near right bank. Elevation of zero maintained at 96.57 feet.

*Bench-mark.*—Top of iron post near gauge on right bank. Assumed elevation, 100.00 feet.

*Channel.*—Composed of gumbo.

*Discharge measurements.*—Made with meter or with a weir.

*Observer.*—Mr. W. Clark.

*Remarks.*—This station was established October 15, 1915, by H. R. Carscallen. No records are available for 1915.

## BULLSHEAD CREEK AT CLARK'S RANCH.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 15, Tp. 9, Rge. 5, W. 4th Mer., at Clark's ranch.

*Records available.*—October 9, 1911, to May 16, 1915. Station discontinued May 16, 1915.

*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 88.45 feet since the station was established.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet. <sup>a</sup>

*Channel.*—Practically permanent.

*Winter flow.*—Station discontinued during winter season.

*Diversions.*—Water is diverted by Clark Brothers, above this station, for irrigation purposes.

*Observer.*—W. E. Clark.

*Remarks.*—A station was established at Johnston's ranch about fifteen miles below this station as it was considered more valuable records could be obtained at that point.

DISCHARGE MEASUREMENTS of Bullshead Creek at Clark's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 23.....	R. J. Srigley.....	53.0	54.0	2.39	2.85	129.00
April 6.....	H. B. R. Thompson.....	19.7	26.0	0.55	1.60	14.20
May 13.....	H. W. Rowley.....	20.5 <sup>a</sup>	23.8	0.55	1.02	0.62
May 15.....	do.....				1.52	12.00
Aug. 21.....	do.....				0.86	Nil.
Sept. 13.....	do.....				1.05	0.69
Oct. 9.....	do.....				1.01	Nil. <sup>b</sup>

<sup>a</sup> Weir measurement.

<sup>b</sup> Seeping from pool to pool.

## SESSIONAL PAPER No. 25c

## DAILY GAUGE HEIGHT AND DISCHARGE OF Bullshead Creek at Clark's Ranch, for 1915.

DAY.	March.		April.		May.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2.05	41.00	0.98	0.56
2			2.98	148.00	1.03	1.10
3			3.45	223.00	1.03	1.10
4			2.20	53.00	1.05	1.10
5			1.85	28.00	1.05	1.10
6			1.64	17.00	1.05	1.10
7			1.58	14.20	1.05	1.10
8			1.52	11.80	1.04	1.00
9			1.46	9.80	1.02	0.80
10			1.45	9.50	1.00	0.60
11			1.40	8.00	1.00	0.60
12			1.35	6.50	1.00	0.60
13	0.39	Nil.	1.35	6.50	1.02	0.80
14	0.41	"	1.42	8.60	1.13	2.30
15	0.60	"	1.30	5.00	1.42	8.60
16	0.70	"	1.28	4.60	1.32	5.60a
17	0.81	"	1.28	4.60		
18	1.08	1.40	1.26	4.20		
19	1.36	6.80	1.20	3.00		
20	2.08	43.00	1.15	2.30		
21	2.63	100.00	1.15	2.30		
22	3.03	155.00	1.14	2.20		
23	2.82	125.00	1.14	2.20		
24	2.18	51.00	1.12	1.85		
25	1.98	36.00	1.10	1.60		
26	1.97	35.00	1.09	1.50		
27	1.75	22.00	1.06	1.20		
28	1.90	31.00	1.05	1.10		
29	1.98	36.00	1.05	1.10		
30	1.68	19.00	1.03	0.90		
31	1.77	24.00				

a Station discontinued.

## MONTHLY DISCHARGE OF Bullshead Creek at Clark's Ranch, for 1915.

(Drainage area 56 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (13-31)	155.00	0.00	22.00	0.3950	0.46	1,353
April	223.00	0.90	21.00	0.3720	0.42	1,250
May (1-16)	8.60	0.56	1.75	0.0312	0.02	56
The period					0.90	2,659

## BULLSHEAD CREEK AT JOHNSTON'S RANCH.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 4, Tp. 11, Rge. 5, W. 4th Mer., at J. A. Johnston's ranch. This station was established May 15, 1915, and the former station at Clark's ranch was discontinued May 16, 1915.

*Records available.*—May 15, 1915, to October 31, 1915.

*Gauge.*—Vertical staff. The zero has been maintained at 94.31 feet.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Practically permanent.

*Winter flow.*—Station discontinued during winter season.

*Observer.*—J. A. Johnston.

## DISCHARGE MEASUREMENTS of Bullshead Creek at Johnston's Ranch, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
May 15.....	H. W. Rowley.....	26.0	17.3	0.71	1.50	12.30
June 10.....	do.....	10.0	6.6	0.75	1.36	5.00
June 30.....	do.....	<sup>a</sup>			1.20	1.02
July 23.....	do.....	49.0	36.8	1.30	1.84	48.00
Aug. 21.....	do.....				0.97	Nil.
Sept. 14.....	do.....				0.98	"
Oct. 11.....	do.....				0.98	"
Oct. 31.....	do.....				0.97	"

<sup>a</sup> Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Bullshead Creek at Johnston's Ranch, for 1915.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			1.00	0.10	1.20	1.10	1.28	2.60	0.97	Nil.	0.97	Nil.
2.....			1.45	9.10	1.20	1.10	1.23	1.58	0.97	"	0.98	"
3.....			1.64	23.00	1.18	0.90	1.23	1.58	0.97	"	0.98	"
4.....			1.70	29.00	1.15	0.60	1.15	0.60	0.97	"	0.98	"
5.....			1.78	39.00	1.09	0.32	1.11	0.40	0.96	"	0.97	"
6.....			2.20	114.00	1.08	0.29	1.09	0.32	0.96	"	0.97	"
7.....			2.00	74.00	1.80	42.00	1.03	0.16	0.97	"	0.97	"
8.....			1.80	42.00	1.85	49.00	<sup>a</sup> Nil.		0.98	"	0.98	"
9.....			1.38	5.80	1.51	13.00	"	0.98	"	0.98	"	"
10.....			1.36	5.00	1.42	7.60	"	0.98	"	0.98	"	"
11.....			1.36	5.00	1.38	5.80	"	0.98	"	0.98	"	"
12.....			1.36	5.00	1.36	5.00	"	0.98	"	0.98	"	"
13.....			1.34	4.30	1.33	4.00	"	0.98	"	0.98	"	"
14.....	1.25	1.90	1.33	4.00	1.84	15.10	"	0.98	"	0.98	"	"
15.....	1.50	12.30	1.33	4.00	1.99	72.00	"	0.98	"	0.98	"	"
16.....	1.43	8.10	1.29	2.80	2.16	106.00	"	0.98	"	0.98	"	"
17.....	1.40	6.60	1.29	2.80	1.79	41.00	"	0.97	"	0.98	"	"
18.....	1.34	4.30	1.27	2.30	1.73	33.00	"	0.97	"	0.98	"	"
19.....	1.34	4.30	1.27	2.30	1.50	12.30	"	0.98	"	0.98	"	"
20.....	1.34	4.30	1.25	1.90	1.43	8.10	"	0.98	"	0.98	"	"
21.....	1.32	3.60	1.25	1.90	1.40	6.60	0.97	"	0.98	"	0.98	"
22.....	1.32	3.60	1.24	1.74	1.22	1.42	0.97	"	0.97	"	0.98	"
23.....	1.28	2.60	1.22	1.42	1.77	38.00	0.97	"	0.96	"	0.98	"
24.....	1.25	1.50	1.21	1.26	1.83	46.00	0.97	"	0.96	"	0.97	"
25.....	1.25	1.90	1.17	0.80	1.69	28.00	0.97	"	0.96	"	0.97	"
26.....	1.22	1.42	1.23	1.58	1.67	26.00	0.97	"	0.96	"	0.97	"
27.....	1.21	1.26	1.25	1.90	1.61	21.00	0.97	"	0.97	"	0.97	"
28.....	1.20	1.10	1.30	3.00	1.57	17.40	0.97	"	0.97	"	0.98	"
29.....	1.20	1.10	1.25	1.90	1.50	12.30	0.97	"	0.97	"	0.98	"
30.....	1.00	0.10	1.21	1.26	1.46	9.70	0.97	"	0.97	"	0.98	"
31.....	1.00	0.10			1.35	4.60	0.97	"			0.98	"

<sup>a</sup> Water standing in pools.

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Bullshead Creek at Johnston's Ranch, for 1915.

(Drainage area 134 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May (14-31).....	12.30	0.10	3.40	0.02540	0.020	120
June.....	114.00	0.10	13.10	6.09780	0.110	780
July.....	106.00	0.29	20.00	0.15200	0.180	1,248
August.....	2.60	0.00	0.23	0.00172	0.002	14
September.....						Nil.
October.....						Nil.
The period.....					0.312	2,162

## STARK AND BURTON DITCH FROM BULLSHEAD CREEK.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 17, Tp. 11, Rge. 5, W. 4th Mer., at Stark and Burton's ranch, near Medicine Hat.

*Records available.*—Estimates are available for the years of 1912-14, complete records for 1915.

*Gauge.*—Vertical staff. The zero of the gauge has been maintained at 94.58 feet, since establishment.

*Bench-mark.*—Permanent iron bench-mark established twenty-nine feet SW. from gauge rod. Assumed elevation, 100.00 feet.

*Channel.*—Composed of sand and gravel.

*Discharge measurements.*—Made by wading with a meter.

*Control.*—On September 14, 1915, a permanent seven-foot sharp crested rectangular weir was installed twenty-five feet below the gauge rod. The elevation of the crest is maintained at 95.39 feet.

*Observer.*—R. E. Stark.

## DISCHARGE MEASUREMENTS of Stark and Burton Ditch from Bullshead Creek, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
April 21.....	H. R. Carscallen.....	6.4	2.88	0.94	0.66	2.70
May 15.....	H. W. Rowley.....	9.0	4.70	2.11	0.99	9.90
June 10.....	do.....	9.0	3.80	1.24	0.80	4.80
June 30.....	do.....	6.0	2.00	0.67	0.62	1.34
July 24.....	do.....				0.45	Nil.
Aug. 21.....	do.....				Dry.	"
Sept. 14.....	do.....				"	"
Oct. 11.....	do.....				"	"
Oct. 31.....	do.....				"	"

DAILY GAUGE HEIGHT AND DISCHARGE of Stark and Burton Ditch from Bullshead Creek, for 1915.

DAY.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....			Dry.	Nil.	0.85	6.10
2.....			"	"	0.85	6.10
3.....			"	"	0.75	3.70
4.....			"	"	0.75	3.70
5.....	0.65	1.85	"	"	0.65	1.85
6.....	0.85	6.10	"	"	0.45	Nil.
7.....	0.85	6.10	"	"	0.65	1.85
8.....	1.05	12.00	"	"	0.85	6.10
9.....	1.25	19.50	"	"	0.85	6.10
10.....	1.20	17.60	"	"	0.85	6.10
11.....	1.60	33.00	"	"	a	
12.....	1.25	19.50	"	"		
13.....	1.05	12.00	"	"		
14.....	1.20	17.60	"	"		
15.....	0.85	6.10	1.05	12.00		
16.....	0.85	6.10	0.65	1.85		
17.....	0.75	3.70	0.65	1.85		
18.....	0.75	3.70	0.45	Nil.		
19.....	0.75	3.70	0.35	"		
20.....	0.75	3.70	0.65	1.85		
21.....	0.65	1.85	0.65	1.85		
22.....	0.65	1.85	0.65	1.85		
23.....	0.65	1.85	0.25	Nil.		
24.....	0.65	1.85	Dry.	"		
25.....	0.55	0.68	"	"		
26.....	0.55	0.68	"	"		
27.....	0.45	Nil.	"	"		
28.....	0.45	"	"	"		
29.....	Dry.	"	"	"		
30.....	"	"	"	"		
31.....	"	"	"	"		

a Not using water.

MONTHLY DISCHARGE of Stark and Burton Ditch from Bullshead Creek, for 1915.

MONTH	DISCHARGE IN SECOND-FEET.			Total discharge in Acre-feet.
	Maximum.	Minimum.	Mean.	
April (5-30).....	33.0	Nil.	7.00	359
May.....	12.0	"	0.68	42
June (1-10).....	6.1	"	4.20	83
The period.....				484

## BULLSHEAD CREEK NEAR DUNMORE.

*Location.*—On the SW.  $\frac{1}{4}$  Sec. 16, Tp. 12, Rge. 5, W. 4th Mer., at the traffic bridge about four miles east of Medicine Hat and about one mile above the junction of Ross and Bullshead creeks.

*Records available.*—July 26, 1909, to October 31, 1915.

*Gauge.*—Staff. Elevation of zero of gauge 2295.65 feet during 1909–11; elevation of zero of gauge 2295.01 feet during 1912; elevation of zero of gauge 2295.06 feet during 1913–15.

*Bench-mark.*—Permanent iron bench-mark. Elevation 2305.53 feet above mean sea level. (Geodetic Survey.)

*Channel.*—Shifting.

*Discharge measurements.*—From bridge, by wading or with weir.

*Gauge heights.*—Owing to it being impossible to obtain an observer, no records were obtained during 1915.

*Winter flow.*—Observations discontinued during winter.



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## DISCHARGE MEASUREMENTS of Bullshead Creek near Dunmore, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 20.....	R. J. Srigley.....	33.0	25.00	1.34	2.18	33.00
Mar. 24.....	do.....	39.0	58.60	1.67	2.65	98.00
April 5.....	H. B. R. Thompson.....	38.5	54.27	1.69	2.51	92.00
June 1.....	R. J. McGuinness.....	5.6	1.01	0.48	1.25	0.48
June 8.....	do.....	28.4	13.30	0.94	1.78	12.60
July 17.....	H. B. R. Thompson.....	26.0	11.20	1.26	1.83	14.20
Aug. 25.....	do.....	2.4	0.62	0.20	1.10	0.12
Sept. 22.....	do.....	5.0	0.74	0.39	1.14	0.29
Oct. 18.....	do.....	6.0	0.64	0.45	1.14	0.29

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Ross Creek drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Oct. 13....	H. W. Rowley....	Ross Creek.....	NE. 24-9-3-4.....	10	6.10	0.67	4.19

## SEVENPERSONS RIVER DRAINAGE BASIN.

*General Description.*

Sevenpersons River lies between the South Saskatchewan River and the Cypress Hills and empties into the South Saskatchewan River at Medicine Hat. The drainage area consists mostly of open, level prairie, which has a small rainfall and a run-off confined chiefly to the spring freshet.

The creek has a considerable flow during the month of April, but the discharge decreases to nil about June.

There are no irrigation works of importance on this stream, and the records are valuable chiefly for statistical purposes.

## SEVENPERSONS RIVER AT MEDICINE HAT.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 30, Tp. 12, Rge. 5, W. 4th Mer., at the bridge on the road between Medicine Hat and Dunmore and about one and one-half miles east of the Canadian Pacific Railway station at Medicine Hat.

*Records available.*—April 27, 1910, to October 31, 1915.

*Gauge.*—Vertical staff. Elevation of zero maintained at 86.68 feet since establishment.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Shifting.

*Discharge measurements.*—From bridge, by wading or with weir.

*Winter flow.*—Observations discontinued during the winter.

*Observer.*—J. W. Pickering.

## DISCHARGE MEASUREMENTS of Sevenpersons River near Medicine Hat, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec. ft.</i>
Mar. 20.....	R. J. Srigley.....	5.0	2.50	1.74	2.72	4.40
Mar. 24.....	do.....	47.0	73.50	4.70	3.82	345.00
April 5.....	H. B. R. Thompson.....	43.5	107.57	3.68	3.91	397.00
June 1.....	R. J. McGuinness.....	3.9	0.70	0.99	1.44	0.70
June 8.....	do.....	17.5	10.54	1.19	1.82	12.00
July 17.....	H. B. R. Thompson.....	5.0	1.40	0.26	1.35	0.26
Aug. 25.....	do.....	4.0	0.90	0.17	1.20	0.15
Sept. 22.....	do.....	5.0	1.90	0.29	1.50	0.55
Oct. 18.....	do.....	4.5	1.64	0.21	1.38	0.34

DAILY GAUGE HEIGHT AND DISCHARGE of Sevenpersons River near Medicine Hat, for 1915.

DAY.	March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....			2.54	65.0	1.62	3.90	1.35	0.33
2.....			2.64	76.0	1.66	5.40	1.45	0.77
3.....			2.92	112.0	1.62	3.90	1.61	3.60
4.....			4.00	450.0	1.65	5.00	1.75	9.00
5.....			4.00	450.0	1.65	5.00	1.93	17.50
6.....			3.93	406.0	1.67	5.70	1.91	16.50
7.....			3.04	132.0	1.70	6.80	1.82	12.20
8.....			2.92	112.0	1.66	5.40	1.77	9.90
9.....			2.85	102.0	1.60	3.20	1.63	4.30
10.....			2.59	71.0	1.57	2.60	1.59	3.00
11.....			2.52	63.0	1.53	1.73	1.55	2.20
12.....			2.42	53.0	1.50	1.10	1.50	1.10
13.....			2.22	37.0	1.55	2.20	1.49	1.03
14.....			2.15	32.0	1.62	3.90	1.46	0.84
15.....			2.12	29.0	1.73	8.10	1.44	0.70
16.....			1.98	20.0	1.80	11.20	1.42	0.57
17.....			1.86	14.1	1.82	12.20	1.42	0.57
18.....			1.78	10.3	1.71	7.20	1.40	0.44
19.....			1.72	7.7	1.72	7.70	1.40	0.44
20.....			1.69	6.4	1.66	5.40	1.51	1.31
21.....			1.70	6.8	1.62	3.90	1.54	1.94
22.....			1.68	6.1	1.56	2.40	1.61	3.60
23.....			1.69	6.4	1.51	1.31	1.63	4.30
24.....			1.70	6.8	1.46	0.84	1.65	5.00
25.....			1.71	7.2	1.40	0.44	1.68	6.10
26.....			1.64	4.6	1.34	0.30	1.70	6.80
27.....			1.60	3.2	1.29	0.20	1.68	6.10
28.....	3.32	184	1.62	3.9	1.27	0.19	1.65	5.00
29.....	2.92	112	1.64	4.6	1.24	0.17	1.61	3.60
30.....	2.52	63	1.60	3.2	1.27	0.19	1.59	3.00
31.....	2.57	69	.....	.....	1.30	0.21	.....	.....

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DAILY GAUGE HEIGHT AND DISCHARGE of Sevenpersons River near Medicine Hat, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	1.54	1.94	1.58	2.80	1.12	0.09	1.38	0.39
2.....	1.50	1.10	1.52	1.52	1.19	0.13	1.43	0.64
3.....	1.48	0.97	1.49	1.03	1.28	0.20	1.45	0.77
4.....	1.45	0.77	1.46	0.84	1.33	0.28	1.47	0.90
5.....	1.40	0.44	1.43	0.64	1.36	0.35	1.43	0.97
6.....	1.36	0.35	1.41	0.51	1.37	0.37	1.49	1.03
7.....	1.31	0.23	1.36	0.35	1.39	0.42	1.48	0.97
8.....	1.25	0.18	1.35	0.33	1.42	0.57	1.48	0.97
9.....	1.15	0.11	1.36	0.35	1.40	0.44	1.49	1.03
10.....	1.10	0.08	1.36	0.35	1.42	0.57	1.48	0.97
11.....	1.12	0.09	1.39	0.42	1.44	0.70	1.47	0.90
12.....	1.18	0.13	1.41	0.51	1.45	0.77	1.46	0.84
13.....	1.22	0.15	1.43	0.64	1.46	0.84	1.45	0.77
14.....	1.31	0.23	1.45	0.77	1.48	0.97	1.43	0.64
15.....	1.36	0.35	1.44	0.70	1.50	1.10	1.41	0.51
16.....	1.41	0.51	1.41	0.51	1.51	1.31	1.39	0.42
17.....	1.46	0.84	1.39	0.42	1.52	1.52	1.39	0.42
18.....	1.46	0.84	1.37	0.37	1.52	1.52	1.42	0.57
19.....	1.44	0.70	1.36	0.35	1.47	0.90	1.43	0.64
20.....	1.43	0.64	1.34	0.30	1.42	0.57	1.45	0.77
21.....	1.41	0.51	1.31	0.23	1.37	0.37	1.47	0.90
22.....	1.41	0.51	1.29	0.20	1.35	0.33	1.47	0.90
23.....	1.43	0.64	1.24	0.17	1.33	0.28	1.48	0.97
24.....	1.45	0.77	1.19	0.13	1.33	0.28	1.46	0.84
25.....	1.49	1.03	1.17	0.12	1.34	0.30	1.48	0.97
26.....	1.53	1.73	1.12	0.09	1.34	0.30	1.47	0.90
27.....	1.57	2.60	1.10	0.08	1.33	0.28	1.46	0.84
28.....	1.63	4.30	1.07	0.06	1.35	0.33	1.47	0.90
29.....	1.64	4.60	1.07	0.06	1.34	0.30	1.48	0.97
30.....	1.63	4.30	1.09	0.07	1.33	0.28	1.48	0.97
31.....	1.61	3.60	1.11	0.09	.....	.....	1.47	0.90

## MONTHLY DISCHARGE of Sevenpersons River near Medicine Hat, for 1915.

(Drainage area 797 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March (28-31).....	184.00	63.00	107.00	0.1340	0.020	849
April.....	450.00	3.20	78.00	0.0980	0.110	4,641
May.....	12.20	0.17	3.80	0.0048	0.006	234
June.....	17.50	0.33	4.40	0.0055	0.006	262
July.....	4.60	0.08	1.14	0.0014	0.002	70
August.....	2.80	0.06	0.48	0.0006	0.001	30
September.....	1.52	0.09	0.56	0.0007	0.001	33
October.....	1.03	0.39	0.81	0.0010	0.001	30
The period.....	.....	.....	.....	.....	0.147	6,169

LAKE JOHNSTON DRAINAGE BASIN.

General Description.

Lake Johnston lies about twenty miles southwest of the city of Moosejaw. It is about twenty-five miles long and fifteen wide, and covers an area of nearly five townships. Almost all the drainage into the lake comes from the south and west, through Wood River. The main tributaries of Wood River are Wiwa Creek, Notukeu Creek, Pinto Creek and Wood Creek. These drain a large area, but owing to the limited rainfall and the small slope of the drainage basin, the run-off is comparatively small.

Lake Johnston has no surface outlet and there has been no surface flow from Lake Chaplin to Lake Johnston for several years. There is often considerable flow in Wood River in the spring, and there is always some discharge at all seasons; nevertheless, the lake has during recent years receded.

The lower part of Wood River has a very small fall and is more of the nature of a long slough than that of a running stream. The channel is from twenty to fifty feet wide, and is from two to five feet deep. The bottom is composed of soft clay and is covered with weeds and grass. There is so little fall that it would be impossible to take out water by gravity and a dam would flood a large area of good agricultural land. There is therefore little possibility of irrigation development in this basin.

This drainage basin includes a large area of very good agricultural land. This is pretty well taken up by settlers and is being farmed with good results. There is one irrigation scheme on Pearce Creek, a tributary of Notukeu Creek.

NOTUKEU CREEK NEAR VANGUARD.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 10, Tp. 11, Rge. 10, W. 3rd Mer.

*Records available.*—August 6, 1914, to December 31, 1915.

*Gauge.*—Vertical staff near traffic bridge. Zero elevation maintained at 77.94 feet since establishment. Vertical staff below a dam one-quarter mile downstream from bridge established August 19, 1915. Zero elevation maintained at elevation 77.04 feet since establishment.

*Bench-marks.*—Painted top of large bolt on plate, top of left pier, downstream side. Assumed elevation, 100.00 feet. Permanent iron bench-mark on right bank, thirty feet upstream from new gauge. Elevation, 85.19 feet above same datum as first bench-mark.

*Channel.*—Above dam, gauge heights affected by changes in dam; below dam, permanent.

*Discharge measurements.*—By wading or from traffic bridge.

*Open water.*—April 4, to November 9, 1915.

*Accuracy.*—Owing to a combination of circumstances, discharge records for 1915 are only an estimate.

*Observer.*—Miss Constance Ripley.

DISCHARGE MEASUREMENTS of Notukeu Creek at Vanguard, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 14.	J. E. Caughey				1.38	Nil.
Feb. 18.	F. R. Steinberger				1.40	..... <sup>a</sup>
Mar. 11.	do				1.45	..... <sup>a</sup>
June 3.	F. K. Beach	36.5	48.0	0.58	2.59	27.00
June 26.	do	20.5	32.0	0.35	2.50	11.00
Aug. 5.	do	23.0	8.2	1.15	3.74	9.40
Aug. 26.	do	12.8	3.5	0.70	0.71 <sup>b</sup>	2.50
Sept. 27.	do	12.7	3.1	0.76	0.72 <sup>b</sup>	2.30
Oct. 19.	do	11.0	4.0	0.96	1.96	3.90
					0.78 <sup>b</sup>	
Nov. 11.	W. R. McCaffrey	12.0	8.2	0.32	0.70 <sup>b</sup>	2.60
Nov. 23.	do	9.5	2.4	0.58	0.62 <sup>b</sup>	1.42
Dec. 7.	do	7.0	1.6	0.59	0.50 <sup>b</sup>	0.95
Dec. 21.	do	7.0	1.2	0.57	0.43 <sup>b</sup>	0.68

<sup>a</sup> Small trickle.

<sup>b</sup> New gauge

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DAILY GAUGE HEIGHT AND DISCHARGE of Notukeu Creek near Vanguard, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.32a	Nil.	1.38	Nil.	1.42	Nil.	5.64	28.0	1.90	25.0	1.98	25.0
2.....	1.32	"	1.38	"	1.42	"	5.52	30.0	1.90	24.0	2.04	25.0
3.....	1.32	"	1.38	"	1.42	"	5.62	39.0	1.90	24.0	2.11	27.0
4.....	1.31	"	1.38	"	1.42	"	5.80a	60.0	1.89	24.0	2.19	27.0
5.....	1.25	"	1.38	"	1.42	"	.....	200.0	1.87	24.0	2.28	27.0
6.....	1.18	"	1.38	"	1.42	"	5.60	90.0	1.87	24.0	2.35	27.0
7.....	1.18	"	1.38	"	1.42	"	3.78	58.0	1.88	24.0	2.39	27.0
8.....	1.15	"	1.38	"	1.42	"	3.57	48.0	1.88	24.1	2.41	26.0
9.....	1.15	"	1.38	"	1.46	"	3.17	44.0	1.88	24.0	2.41	26.0
10.....	1.16	"	1.38	"	1.48	"	2.88	42.0	1.88	25.0	2.41	25.0
11.....	1.16	"	1.38	"	1.50	"	2.68	40.0	1.91	26.0	2.43	25.0
12.....	1.15	"	1.38	"	1.52	"	2.62	38.0	1.91	27.0	2.43	24.0
13.....	1.15	"	1.38	"	1.54	"	2.52	36.0	1.95	27.0	2.46	23.0
14.....	1.10	"	1.38	"	1.56	0.3	2.43	35.0	2.01	28.0	2.46	22.0
15.....	1.38	"	1.38	"	1.58	0.5	2.33	34.0	2.08	28.0	2.46	21.0
16.....	1.38	"	1.38	"	1.60	0.7	2.23	33.0	2.14	28.0	2.46	20.0
17.....	1.36	"	1.38	"	1.63	0.8	2.23	32.0	2.15	28.0	2.48	19.1
18.....	1.36	"	1.40	"	1.65	1.0	2.19	32.0	2.15	28.0	2.48	18.2
19.....	1.36	"	1.40	"	1.65	1.2	2.15	31.0	2.15	28.0	2.49	17.3
20.....	1.36	"	1.40	"	1.65	1.8	2.11	30.0	2.15	28.0	2.51	16.4
21.....	1.36	"	1.40	"	1.65	2.0	2.11	30.0	2.15	27.0	2.48	15.7
22.....	1.36	"	1.40	"	3.68	15.0	2.05	29.0	2.15	27.0	2.48	14.8
23.....	1.39	"	1.40	"	3.81	17.8	1.97	28.0	2.15	27.0	2.48	13.9
24.....	1.39	"	1.40	"	3.65	18.8	1.91	27.0	2.15	28.0	2.49	12.9
25.....	1.39	"	1.40	"	4.46	20.0	1.90	26.0	2.17	28.0	2.49	12.0
26.....	1.39	"	1.40	"	.....	21.0	1.90	26.0	2.19	28.0	2.50	11.0
27.....	1.36	"	1.40	"	.....	22.0	1.90	26.0	2.18	26.0	2.50	10.8
28.....	1.36	"	1.45	"	.....	24.0	1.90	26.0	2.08	25.0	2.50	10.7
29.....	1.36	"	.....	.....	5.60	25.0	1.90	26.0	2.00	24.0	2.50	10.6
30.....	1.36	"	.....	.....	5.48	26.0	1.90	26.0	1.92	24.0	2.50	10.5
31.....	1.36	"	.....	.....	5.36	27.0	.....	.....	1.90	24.0	.....	.....

a-a Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Notukeu Creek near Vanguard, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	2.57	10.4	3.69	9.2	0.68	2.0	0.70	2.5	0.76	4.0	0.62	1.30
2.....	2.58	10.4	4.04	9.2	0.67	1.8	0.70	2.5	0.74	3.7	0.59	1.20
3.....	2.68	10.4	3.97	9.2	0.67	1.7	0.70	2.5	0.74	3.0	0.55	1.10
4.....	2.70	10.4	3.83	9.3	0.67	1.7	0.70	2.3	0.72	2.7	0.50	1.00
5.....	3.12	10.4	3.74	9.4	0.67	1.7	0.72	2.4	0.71	2.7	0.51	1.00
6.....	3.42	10.3	3.71	9.3	0.67	1.7	0.73	2.9	0.71	2.7	0.50	0.97
7.....	3.47	10.2	3.68	9.0	0.67	1.7	0.74	3.2	0.71	2.4	0.50	0.96
8.....	3.52	10.2	3.58	8.8	0.67	1.7	0.75	3.3	0.70	2.4	0.53	0.96
9.....	3.63	10.2	3.56	8.3	0.67	1.7	0.75	3.4	0.70 <sup>b</sup>	2.5	0.56	0.98
10.....	3.58	10.2	3.52	7.8	0.67	1.7	0.75	3.4	0.70	2.6	0.58	0.99
11.....	3.50	10.1	3.50	7.0	0.67	1.8	0.75	3.4	0.70	2.6	0.60	0.99
12.....	3.30	10.1	3.48	6.3	0.67	1.8	0.75	3.4	0.70	2.4	0.60	1.00
13.....	3.30	10.1	3.44	5.8	0.70	2.2	0.75	3.5	0.70	2.1	0.60	0.99
14.....	3.38	10.1	3.40	5.0	0.70	2.4	0.75	3.5	0.70	2.1	0.60	0.98
15.....	3.47	10.1	3.33	4.4	0.70	2.4	0.75	3.5	0.70	2.1	0.60	0.97
16.....	3.47	10.1	3.26	3.8	0.70	2.4	0.75	3.5	0.70	2.1	0.60	0.96
17.....	3.48	10.1	2.62	3.2	0.70	2.4	0.75	3.5	0.70	2.0	0.60	0.94
18.....	3.49	10.1	2.19	2.8	0.70	2.3	0.75	3.6	0.69	2.0	0.60	0.89
19.....	3.43	10.0	0.64 <sup>a</sup>	2.4	0.70	2.3	0.75	3.6	0.67	1.9	0.53	0.76
20.....	3.53	9.9	0.74	3.1	0.70	2.3	0.75	3.7	0.63	1.8	0.43	0.69
21.....	3.62	9.9	0.69	2.2	0.70	2.3	0.76	3.7	0.65	1.7	0.43	0.68
22.....	3.62	9.8	0.64	2.5	0.70	2.3	0.78	3.7	0.63	1.6	0.42	0.67
23.....	3.62	9.7	0.64	2.6	0.70	2.3	0.78	4.0	0.62	1.5	0.41	0.66
24.....	3.62	9.6	0.70	2.5	0.70	2.3	0.78	4.1	0.62	1.5	0.41	0.64
25.....	3.68	9.5	0.70	2.5	0.70	2.4	0.78	4.1	0.64	1.5	0.40	0.62
26.....	3.78	9.5	0.70	2.5	0.70	2.4	0.78	4.1	0.65	1.5	0.39	0.60
27.....	3.70	9.5	0.70	2.4	0.70	2.4	0.78	4.1	0.67	1.5	0.38	0.58
28.....	3.62	9.5	0.70	2.4	0.70	2.5	0.78	4.2	0.69	1.5	0.36	0.55
29.....	3.52	9.5	0.70	2.4	0.70	2.5	0.78	4.2	0.69	1.4	0.34	0.51
30.....	3.42	9.4	0.70	2.3	0.70	2.5	0.78	4.3	0.68	1.4	0.32	0.44
31.....	3.17	9.3	0.70	2.3	.....	.....	0.77	4.2	.....	.....	0.31 <sup>b</sup>	0.35

*a* Observations start at new gauge.*b-b* Ice conditions.

## MONTHLY DISCHARGE of Notukeu Creek near Vanguard, for 1915.

(Drainage area 1,406 square miles).

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January.....	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
February.....	.....	.....	.....	.....	.....	.....
March.....	27.0	0.30	7.30	0.0052	0.006	449
April.....	200.0	26.00	42.00	0.0299	0.033	2,499
May.....	28.0	24.00	26.00	0.0185	0.021	1,599
June.....	27.0	10.50	19.70	0.0140	0.016	1,172
July.....	10.4	9.30	10.00	0.0071	0.008	615
August.....	9.4	2.20	5.20	0.0037	0.004	320
September.....	2.5	1.70	2.10	0.0015	0.002	125
October.....	4.3	2.30	3.50	0.0025	0.003	215
November.....	4.0	1.40	2.20	0.0016	0.002	130
December.....	1.3	0.35	0.84	0.0006	0.001	52
The year.....	.....	.....	.....	.....	0.096	7,176

## SESSIONAL PAPER No. 25c

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Lake Johnston drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
April 14....	F. R. Steinberger..	Pinto Creek.....	NW. 7-6-11-3.....				0.274

## QU'APPELLE RIVER DRAINAGE BASIN.

*General Description.*

Qu'Appelle River rises in Township 23, Range 4, West of the 3rd Meridian, and flows eastward into the Assiniboine River in Township 28, Range 17, West of the 1st Meridian. These waters eventually find their way into Hudson Bay through the Red River, Lake Winnipeg and Nelson River.

The chief tributaries of Qu'Appelle River are Moosejaw Creek, Last Mountain Lake, Wascana Creek and Loon Creek. Last Mountain is the largest lake in the basin, being some sixty miles long and from one to three miles wide.

The valley of the main stream is from two to three hundred feet deep, with a flat from one to three miles wide along the river. This flat is covered in many places with brush, and the side hills are in many places well wooded. The bench lands above the river are mostly level prairie, much of which is now under cultivation.

The mean annual rainfall at Moosejaw is fourteen inches, at Regina fifteen inches, and at Indian Head nineteen inches. The streams are frozen during the winter months, and there is usually an abundant snowfall.

There are several irrigation and many industrial water rights in this basin.

During 1915, the rainfall over part of this drainage area was very deficient, the total precipitation for the twelve months beginning December 1, 1914, at Regina, being 9.54 inches, at Moosejaw 13.72 inches and at Qu'Appelle 18.12 inches. As nearly as can be learned there was no flow during 1915 from Wascana Creek into Wascana Lake, an artificial lake in front of the parliament buildings at Regina.

## QU'APPELLE RIVER AT LUMSDEN.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 33, Tp. 19, Rge. 21, W. 2nd Mer., at farm near Lumsden, Saskatchewan.

*Records available.*—May 12, 1911, to December 31, 1915.

*Gauge.*—Vertical staff. Zero of gauge maintained at elevation of 85.35 feet during 1911-13; and at elevation of 85.16 feet during 1914-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet

*Channel.*—Permanent, but debris on control affects gauge height.

*Discharge measurements.*—By wading or from bridge.

*Winter flow.*—Affected by ice.

*Observers.*—J. G. Miller and W. J. Steele.

## DISCHARGE MEASUREMENTS of Qu'Appelle River at Lumsden, in 1915.

Date	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 1	F. R. Steinberger	12.5	5.88	0.18	1.99	1.06
Jan. 21	do	9.3	3.05	0.25	1.95	0.76
Feb. 19	E. W. Hughes	10.0	2.14	0.00	1.76	0.00
Mar. 10.	do			0.00	1.73	0.00
Mar. 27.	do			0.00	3.00	0.00
April 21	do	18.3	40.88	0.26	2.65	10.73
June 12	F. K. Beach	27.5	43.45	0.16	2.45	7.07
July 29	do	27.0	31.42	0.13	2.24	4.08
Sept. 6	do	19.5	5.63	0.31	2.21	1.74
Sept. 6	do	17.0	9.14	0.24	2.20	2.14
Oct. 5	do	24.5	26.72	0.30	2.54	3.29
Nov. 12	F. R. Steinberger	22.0	26.60	0.32	2.31	7.17
Dec. 3	do	17.0	6.20	0.46	2.26	2.89
Dec. 20	do	11.0	4.15	0.28	2.05	1.20



## DAILY GAUGE HEIGHT AND DISCHARGE of Qu'Appelle River at Lumsden, for 1915.

DAY.	January.		February.		March.		May.		April.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	1.99 <sup>a</sup>	1.05	1.80	0.20	1.69	Nil.	2.78	0.66	2.44	6.9	2.55	8.9
2.....	2.02	1.04	1.80	0.20	1.69	"	2.95	0.89	2.54	8.7	2.52	8.3
3.....	2.00	1.02	1.81	0.20	1.67	"	3.12	1.12	2.54	8.7	2.49	7.8
4.....	1.98	1.02	1.81	0.20	1.69	"	3.15	1.40	2.52	8.3	2.48	7.6
5.....	1.98	1.00	1.82	0.19	1.71	"	3.14	1.62	2.55	8.9	2.49	7.8
6.....	1.97	0.98	1.82	0.19	1.70	"	2.92	2.00	2.52	8.3	2.49	7.8
7.....	1.96	0.97	1.83	0.16	1.70	"	2.94	4.00	2.62	10.2	2.48	7.6
8.....	1.96	0.98	1.81	0.11	1.71	"	2.97	6.10	2.61	10.0	2.44	6.9
9.....	1.98	1.00	1.79	0.08	1.72	"	3.32	8.30	2.61	10.0	2.45	7.1
10.....	1.98	1.04	1.75	0.05	1.72	"	3.26	10.40	2.68	11.3	2.46	7.3
11.....	1.98	1.01	1.73	0.04	1.73	"	3.14	12.50	2.63	10.4	2.50	7.9
12.....	1.98	0.97	1.73	0.03	1.76	"	3.11 <sup>a</sup>	14.70	2.61	10.0	2.46	7.3
13.....	1.99	0.94	1.75	0.02	1.75	"	3.08	18.70	2.64	10.5	2.56	9.1
14.....	2.00	0.91	1.75	0.02	1.73	"	2.95	16.30	2.74	12.4	2.55	8.9
15.....	2.00	0.88	1.75	0.02	1.75	"	2.76	12.80	2.84	14.3	2.52	8.3
16.....	2.01	0.87	1.72	0.01	1.76	"	2.84	14.30	2.94	16.1	2.49	7.8
17.....	2.00	0.84	1.69	Nil.	1.76	"	2.96	16.50	2.95	16.3	2.48	7.6
18.....	2.00	0.81	1.71	"	1.76	"	2.81	13.70	2.96	16.5	2.48	7.6
19.....	2.00	0.80	1.71	"	1.77	"	2.72	12.00	2.99	17.0	2.46	7.3
20.....	2.00	0.78	1.69	"	1.87	0.04	2.66	10.90	2.92	15.8	2.45	7.1
21.....	1.92	0.75	1.69	"	1.91	0.22	2.66	10.90	2.84	14.3	2.49	7.8
22.....	1.90	0.71	1.71	"	3.26	0.31	2.62	10.20	2.74	12.4	2.51	8.1
23.....	1.88	0.69	1.71	"	3.32	0.37	2.62	10.20	2.66	10.9	2.49	7.8
24.....	1.85	0.62	1.70	"	3.33	0.32	2.65	10.70	2.63	10.4	2.46	7.3
25.....	1.83	0.55	1.70	"	3.27	0.20	2.58	9.40	2.63	10.4	2.40	6.3
26.....	1.81	0.47	1.70	"	3.02	0.04	2.54	8.70	2.63	10.4	2.48	7.6
27.....	1.81	0.38	1.67	"	3.00	Nil.	2.53	8.50	2.64	10.5	2.46	7.3
28.....	1.80	0.30	1.69	"	2.95	"	2.48	7.60	2.62	10.2	2.46	7.3
29.....	1.80	0.23	.....	.....	2.90	0.12	2.48	7.60	2.60	9.8	2.43	6.8
30.....	1.80	0.21	.....	.....	2.88	0.29	2.44	6.90	2.58	9.4	2.45	7.1
31.....	1.80	0.20	.....	.....	2.78	0.48	.....	.....	2.56	9.1	.....	.....

a to a Ice conditions.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Qu'Appelle River at Lumsden, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2.46	7.2	2.18	3.4	2.18	2.0	2.50	5.0	2.37	8.20	2.28	2.24
2.	2.54	8.7	2.16	3.2	2.22	2.3	2.54	5.5	2.43	9.30	2.29	2.27
3.	2.52	8.3	2.16	3.2	2.30	3.1	2.54	5.4	2.35	7.80	2.26	2.26
4.	2.46	7.2	2.14	3.0	2.34	3.5	2.57	5.8	2.37	8.20	2.27	2.25
5.	2.44	6.9	2.12	2.8	2.36	3.7	2.60	6.2	2.39	8.60	2.29	2.23
6.	2.43	6.7	2.12	2.8	2.20	2.2	2.57	6.2	2.37	8.20	2.26	2.24
7.	2.44	6.9	2.10	2.6	2.24	2.5	2.57	6.6	2.41a	7.00	2.28	2.26
8.	2.41	6.4	2.08	2.4	2.34	3.5	2.57	7.2	2.43a	5.20	2.30	2.28
9.	2.46	7.2	2.05	2.1	2.36	3.7	2.57	7.7	2.45b	3.80	2.27	2.25
10.	2.44	6.9	2.02	1.9	2.36	3.7	2.56	8.0	2.43	2.50	2.26	2.24
11.	2.42	6.6	2.01	1.8	2.39	4.1	2.56	8.6	2.42	2.50	2.23	2.24
12.	2.44	6.9	2.04	2.0	2.41	4.3	2.56	9.2	2.41	2.31	2.21	2.23
13.	2.41	6.4	2.06	2.2	2.46	5.0	2.58	10.3	2.38	2.27	2.24	2.20
14.	2.38	6.0	2.05	2.1	2.52	5.8	2.60	11.2	2.37	2.16	2.19	2.13
15.	2.40	6.3	2.02	1.9	2.48	5.2	2.56	11.1	2.36	2.10	2.17	2.17
16.	2.40	6.3	2.03	1.9	2.32	3.3	2.57	12.0	2.32	2.09	2.14	2.15
17.	2.40	6.3	2.06	2.2	2.35	3.6	2.56	11.8	2.34	2.10	2.10	2.13
18.	2.38	6.0	2.06	2.2	2.35	3.6	2.60	12.5	2.34	2.11	2.08	2.10
19.	2.36	5.7	2.08	2.4	2.31	3.1	2.57	12.0	2.31	2.14	2.06	2.08
20.	2.38	6.0	2.11	2.7	2.34	3.4	2.54	11.4	2.34	2.17	2.05	2.05
21.	2.38	6.0	2.19	3.4	2.32	3.2	2.58	10.3	2.30	2.18	2.06	2.05
22.	2.32	5.1	2.14	2.8	2.34	3.4	2.54	11.4	2.32	2.19	2.03	2.04
23.	2.30	4.8	2.10	2.3	2.34	3.4	2.55	11.6	2.34	2.19	2.01	2.02
24.	2.28	4.6	2.14	2.5	2.35	3.4	2.52	11.0	2.37	2.21	2.02	1.98
25.	2.30	4.8	2.25	3.5	2.36	3.5	2.50	10.7	2.37	2.21	2.03c	1.91
26.	2.28	4.6	2.30	3.9	2.38	3.7	2.47	10.1	2.34	2.21	2.04	1.74
27.	2.24	4.1	2.35	4.3	2.40	3.9	2.44	9.5	2.32	2.22	2.02	1.71
28.	2.20	3.6	2.32	3.7	2.46	4.6	2.44	9.5	2.35	2.23	2.01	1.69
29.	2.20	3.6	2.20	2.4	2.46	4.6	2.46	9.9	2.36	2.22	2.01	1.60
30.	2.19	3.5	2.19	2.1	2.46	4.5	2.50	10.7	2.32	2.23	2.02	1.44
31.	2.18	3.4	2.16	1.8			2.47	10.1			1.99b	1.37

a Freeze up; discharge interpolated.

b to b Ice conditions.

c Gauge height interpolated.

## MONTHLY DISCHARGE of Qu'Appelle River at Lumsden, for 1915.

(Drainage area 6,160 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	1 05	0 20	0 77	0 00012	0 0001	47
February	0 20	Nil.	0 06	0 00001	0 0000	3
March	0 48	"	0 08	0 00001	0 0000	5
April	18 70	0 66	9 00	0 00146	0 0016	536
May	17 00	6 90	11 20	0 00182	0 0020	689
June	9 10	6 30	7 60	0 00123	0 0014	452
July	8 70	3 40	5 90	0 00096	0 0011	363
August	4 30	1 80	2 60	0 00042	0 0005	160
September	5 80	2 60	3 70	0 00060	0 0007	220
October	12 50	5 00	9 30	0 00150	0 0017	552
November	9 30	2 09	3 80	0 00062	0 0007	226
December	2 28	1 37	2 10	0 00034	0 0004	129
The year					0 0102	3,402

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Qu'Appelle River drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
April 22. . . .	E. W. W. Hughes..	Wascana Creek....	Regina.....	.....	.....	.....	Nil.
Sept. 21. . . .	F. K. Beach.....	do .....	do .....	.....	.....	.....	.....

## MOOSEJAW CREEK DRAINAGE BASIN.

*General Description.*

Moosejaw Creek rises in the Yellowgrass Marsh, which lies in Townships 9 and 10, Range 17, West of the 2nd Meridian, and flows in a north and westerly direction until it reaches the city of Moosejaw, where it is joined by Thunder Creek. From Moosejaw it follows an easterly and northerly course, finally emptying into the Qu'Appelle River near Buffalo Pound Lake. From the headwaters to the city of Moosejaw the drainage area is estimated at about 1,830 square miles. This area is almost entirely devoid of tree growth, except in the vicinity of Moosejaw, where the valley is lined with brush.

Throughout its entire length the creek flows in a very crooked but well defined channel. The upper portion of the valley is small, being merely a depression, but it gradually increases in size until at Drinkwater it is about thirty feet deep and at Moosejaw eighty feet deep. The fall in the creek is very small, and particularly so between Drinkwater and Moosejaw, where the total fall is only 67.5 feet or an average of 2.3 feet per mile of valley.

The Canadian Pacific Railway Company has dams at Milestone, Rouleau, Drinkwater, two at Moosejaw and one at Pasqua. There is also a municipality dam in Section 19, Township 15, Range 24, West of the 2nd Meridian, which supplies water to the neighbourhood during periods when there is no flow in the creek, and the city of Moosejaw has a dam within the city limits to store water for fire fighting purposes.

Precipitation in this drainage basin during 1915 was very deficient. At Moosejaw, a large part of the area ordinarily flooded by the several dams became nearly dry late in the summer, leaving a noticeable shortage of water.

## MOOSEJAW CREEK NEAR LANG.

*Location.*—On traffic bridge on road allowance, east of the NE.  $\frac{1}{4}$  Sec. 24, Tp. 11, Rge. 19, W. 2nd Mer., four miles west of the village of Lang.

*Records available.*—From June 21, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation of gauge was maintained at 94.80 feet during 1911; 95.07 feet during 1912-13; 95.04 feet during 1914 and 1915.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—From bridge or by wading.

*Winter flow.*—No winter observations have been taken.

*Observer.*—Miss Irene Irvine.

*Run-off in 1915.*—Nil.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek near Lang, for 1915.

DAY.	March.		April.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			0.33	Nil.
2.			0.32	"
3.			0.31	"
4.			0.30	"
5.			0.29	"
6.			0.24	"
7.			0.23	"
8.			0.20	"
9.			0.20	"
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.	0.24	Nil.		
23.	0.29	"		
24.	0.28	"		
25.	0.29	"		
26.	0.29	"		
27.	0.34	"		
28.	0.35	"		
29.	0.39	"		
30.	0.39	"		
31.	0.36	"		

Gauge heights shown indicate water in pools. Stream was dry April 10, to October 31.

## MOOSEJAW CREEK AT MCCARTHY'S FARM.

*Location.*—On the NW.  $\frac{1}{4}$  Sec. 16, Tp. 16, Rge. 26 W. 2nd Mer., about three miles south of Moosejaw.

*Records available.*—April 7, 1910, to December 31, 1915.

*Gauge.*—Vertical staff. Zero elevation maintained at 83.03 feet during 1910-11; zero elevation maintained at 82.99 feet during 1912-13; zero elevation maintained at 81.99 feet during 1914-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Permanent.

*Discharge measurements.*—From bridge or by wading.

*Observer.*—Miss Sadie McCarthy.

## DISCHARGE MEASUREMENTS of Moosejaw Creek at McCarthy's Farm, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Jan. 15.	F. R. Steinberger.				1.19	Nil.
Feb. 20.	E. W. W. Hughes.				0.70	"
Mar. 8.	do				0.64	"
April 28.	do	15.0	3.44	0.16	1.51	0.54
June 16.	F. K. Beach.	9.7	2.16	0.13	1.41	0.29
July 30.	do					Nil.
Aug. 23.	do					"
Sept. 23.	do					"
Oct. 25.	do					"
Dec. 7.	F. R. Steinberger.				0.30	"

## DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek at McCarthy's Farm, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.	1.26	Nil.	0.91	Nil.	0.26	Nil.	1.10	Nil.	1.40	0.28	1.39	0.27
2.	1.24	"	0.89	"	0.27	"	1.14a	0.28	1.40	0.28	1.39	0.27
3.	1.23	"	0.85	"	0.28	"	1.55a	0.58	1.40	0.28	1.37	0.24
4.	1.26	"	0.74	"	0.44	"	1.76	3.74	1.40	0.28	1.37	0.24
5.	1.26	"	0.70	"	0.46	"	1.68	2.28	1.40	0.28	1.38	0.25
6.	1.25	"	0.69	"	0.45	"	1.67	2.12	1.41	0.30	1.39	0.27
7.	1.25	"	0.69	"	0.85	"	1.69	2.44	1.41	0.30	1.39	0.27
8.	1.23	"	0.69	"	1.05	"	1.75	3.50	1.40	0.28	1.39	0.27
9.	1.22	"	0.68	"	1.35	"	1.73	3.14	1.39	0.27	1.39	0.27
10.	1.23	"	0.71	"	1.36	"	1.70	2.60	1.39	0.27	1.40	0.28
11.	1.20	"	0.69	"	1.38	"	1.67	2.12	1.39	0.27	1.40	0.28
12.	1.20	"	0.70	"	1.37	"	1.66	1.96	1.43	0.33	1.39	0.27
13.	1.19	"	0.69	"	1.36	"	1.67	2.12	1.41	0.30	1.40	0.28
14.	1.18	"	0.70	"	1.33	"	1.67	2.12	1.45	0.36	1.41	0.30
15.	1.17	"	0.68	"	1.25	"	1.67	2.12	1.57	0.96	1.41	0.30
16.	1.16	"	0.68	"	1.21	"	1.67	2.12	1.59	1.12	1.41	0.30
17.	1.16	"	0.94	"	1.14	"	1.63	1.56	1.57	0.96	1.43	0.33
18.	1.18	"	0.64	"	1.05	"	1.61	1.32	1.55	0.80	1.43	0.33
19.	1.20	"	0.51	"	0.99	"	1.63	1.56	1.51	0.58	1.42	0.31
20.	1.18	"	0.34	"	1.08	"	1.57	0.96	1.49	0.49	1.43	0.33
21.	1.15	"	0.32	"	1.13	"	1.56	0.88	1.47	0.42	1.43	0.33
22.	1.12	"	0.30	"	1.19	"	1.55	0.80	1.46	0.39	1.41	0.30
23.	1.09	"	0.63	"	1.21	"	1.52	0.63	1.45	0.36	1.42	0.31
24.	1.05	"	0.58	"	1.16	"	1.50	0.52	1.43	0.33	1.39	0.27
25.	1.00	"	0.44	"	1.13	"	1.49	0.49	1.41	0.30	1.39	0.27
26.	0.93	"	0.37	"	1.10	"	1.49	0.49	1.43	0.33	1.38	0.25
27.	0.88	"	0.32	"	1.09	"	1.50	0.52	1.44	0.34	1.38	0.25
28.	0.85	"	0.30	"	1.09	"	1.49	0.49	1.43	0.33	1.38	0.25
29.	0.80	"		"	1.09	"	1.46	0.39	1.43	0.33	1.38	0.25
30.	0.77	"		"	1.09	"	1.41	0.30	1.41	0.30	1.37	0.24
31.	0.72	"		"	1.09	"			1.39	0.27		

a Ice breaking up. Discharges estimated.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw Creek at McCarthy's Farm, for 1915.  
—Concluded.

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.37	0.24	1.13	Nil.		Nil.		Nil.		Nil.	0.25	Nil.
2	1.37	0.24	1.11								0.27	
3	1.37	0.24	1.09	"							0.28	
4	1.37	0.24	1.07	"							0.25	
5	1.36	0.22	1.05	"							0.25	
6	1.36	0.22	1.04	"						<i>b</i>	0.32	
7	1.34	0.20	<i>b</i>						0.39		0.30	
8	1.32	0.17		"					0.39		0.27	
9	1.32	0.17		"					0.37		0.33	
10	1.31	0.16		"					0.37		0.20	
11	1.30	0.15		"					0.33		0.15	
12	1.30	0.15		"					0.35		0.10	
13	1.27	0.12		"					0.34		0.11	
14	1.26	0.11		"					0.31		0.09	
15	1.29	0.14		"					0.35		0.06	
16	1.23	0.13		"					0.33		0.05	
17	1.27	0.12		"					0.34		0.05	
18	1.26	0.11		"					0.35		0.08	
19	1.26	0.11		"					0.34		0.08	
20	1.24	0.09		"					0.34		0.10	
21	1.24	0.09		"					0.34		0.17	
22	1.24	0.09		"					0.34		0.14	
23	1.24	0.09		"					0.34		0.11	
24	1.26	0.11		"					0.34		0.10	
25	1.24	0.09		"					0.32		0.08	
26	1.24	0.09		"					0.34		0.04	
27	1.22	0.08		"					0.31		0.09	
28	1.20	0.06		"					0.28		0.07	
29	1.18	0.04		"					0.25		0.06	
30	1.16	0.03		"					0.25		0.03	
31	1.14	0.01		"							0.01	

*b-b* Water in pools.

## MONTHLY DISCHARGE of Moosejaw Creek at McCarthy's Farm, for 1915.

(Drainage area 1,719 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
February	"	"	"	"	"	"
March	"	"	"	"	"	"
April	1.74	0.28	1.47	0.00185	0.0019	87
May	1.12	0.27	0.41	0.00624	0.0062	21
June	0.34	0.24	0.28	0.00016	0.0007	17
July	0.24	0.01	0.13	0.00008	0.0001	5
August	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
September	"	"	"	"	"	"
October	"	"	"	"	"	"
November	"	"	"	"	"	"
December	"	"	"	"	"	"
The year					0.0018	187

## SANDY CREEK NEAR CARON.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 29, Tp. 17, Rge. 29, W. 2nd Mer.

*Records available.*—August 1, to December 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of weir crest since establishment.

*Discharge measurements.*—From thirty-inch trapezoidal weir. Daily observations of head taken by observer.

*Observer.*—James Grazier.

## DISCHARGE MEASUREMENTS of Sandy Creek near Caron, Sask., in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
June 14.....	F. K. Beach.....					1.34a
July 30.....	do.....				0.165	0.56a
Sept. 23.....	do.....				0.157	0.52g
Oct. 26.....	do.....				0.210	0.81a
Dec. 4.....	F. R. Steinberger.....				0.140	0.44a

a Weir measurement.

## DAILY GAUGE HEIGHT AND DISCHARGE of Sandy Creek near Caron, for 1915.

DAY.	August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	0.165	0.56	0.130	0.39	0.190	0.70	0.210	0.81	0.115	0.33
2.....	0.150	0.49	0.125	0.37	0.215	0.84	0.210	0.81	0.115	0.33
3.....	0.140	0.44	0.155	0.51	0.200	0.75	0.220	0.87	0.160	0.54
4.....	0.140	0.44	0.155	0.51	0.190	0.70	0.220	0.87	0.145	0.46
5.....	0.135	0.42	0.150	0.49	0.190	0.70	0.220	0.87	0.155	0.51
6.....	0.130	0.39	0.155	0.51	0.240	0.99	0.215	0.84	0.160	0.54
7.....	0.110	0.31	0.155	0.51	0.225	0.90	0.215	0.84	0.160	0.54
8.....	0.110	0.31	0.155	0.51	0.215	0.84	0.215	0.84	0.160	0.54
9.....	0.110	0.31	0.155	0.51	0.215	0.84	0.205	0.78	0.150	0.49
10.....	0.135	0.42	0.160	0.54	0.215	0.84	0.205	0.78	0.150	0.49
11.....	0.200	0.75	0.165	0.56	0.205	0.78	0.205	0.78	0.150	0.49
12.....	0.135	0.42	0.190	0.70	0.205	0.78	0.190	0.70	0.150	0.49
13.....	0.130	0.39	0.190	0.70	0.205	0.78	0.160	0.54	0.145	0.46
14.....	0.128	0.39	0.190	0.70	0.205	0.78	0.160	0.54	0.140	0.44
15.....	0.115	0.33	0.190	0.70	0.205	0.78	0.170	0.59	0.130	0.39
16.....	0.120	0.35	0.183	0.66	0.210	0.81	0.190	0.70	0.130	0.39
17.....	0.258	1.10	0.183	0.66	0.210	0.81	0.190	0.70	0.130	0.39
18.....	0.203	0.77	0.193	0.71	0.210	0.81	0.200	0.75	0.130	0.39
19.....	0.180	0.64	0.183	0.66	0.210	0.81	0.190	0.70	0.130	0.39
20.....	0.175	0.62	0.183	0.66	0.200	0.75	0.190	0.70	0.120	0.35
21.....	0.165	0.56	0.178	0.63	0.205	0.78	0.190	0.70	0.135	0.42
22.....	0.150	0.49	0.178	0.63	0.210	0.81	0.185	0.67	0.135	0.42
23.....	0.145	0.46	0.155	0.51	0.210	0.81	0.185	0.67	0.130	0.39
24.....	0.140	0.44	0.157	0.52	0.210	0.81	0.185	0.67	0.130	0.39
25.....	0.140	0.44	0.210	0.81	0.210	0.81	0.180	0.64	0.135	0.42
26.....	0.140	0.44	0.195	0.72	0.210	0.81	0.155	0.51	0.140	0.44
27.....	0.165	0.56	0.195	0.72	0.210	0.81	0.150	0.49	0.140	0.44
28.....	0.155	0.51	0.215	0.84	0.210	0.81	0.145	0.46	0.140	0.44
29.....	0.145	0.46	0.200	0.75	0.210	0.81	0.145	0.46	0.140	0.44
30.....	0.140	0.44	0.195	0.72	0.210	0.81	0.115	0.33	0.140	0.44
31.....	0.120	0.35			0.210	0.81			0.140	0.44



## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Sandy Creek near Caron, for 1915.

(Drainage area 92 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
August.....	1.10	0.31	0.48	0.0052	0.006	29
September.....	0.84	0.37	0.61	0.0066	0.007	36
October.....	0.99	0.70	0.80	0.0087	0.010	49
November.....	0.87	0.33	0.69	0.0075	0.008	41
December.....	0.54	0.33	0.44	0.0048	0.006	27
The period.....					0.037	182

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Moosejaw Creek drainage basin, in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
June 16....	F. K. Beach.....	Thunder Creek....	Moosejaw.....				0.01
July 31....	do.....	do.....	do.....				Nil.
June 23....	do.....	Moosejaw Creek....	Sewage disposal plant.....				a

a Too small to measure.

## SOURIS RIVER DRAINAGE BASIN.

## General Description.

The source of the Souris River is in marshes near Yellow Grass, Saskatchewan. From here it flows in a southeasterly direction almost parallel to the Soo line of the Canadian Pacific Railway to Estevan. It then flows east to Oxbow; then it turns south and crosses the international boundary in Range 34, W. of principal Meridian. After making a loop into North Dakota, it recrosses the international boundary in Range 27, West of the 1st Meridian, and flows in a northeasterly direction to Souris, Manitoba, where it turns east, and finally joins the Assiniboine River, in Township 8, Range 16, West of the 1st Meridian.

The chief tributaries of Souris River are: Long Creek, which joins it near Estevan, Moose Mountain Creek near Oxbow, North and South Antler Creeks near Sourisford, Graham Creek at Melita and Pipestone Creek near Souris.

This stream drains a large tract of typical western plains. The rainfall will probably average very little over fifteen inches, and is usually sufficiently divided over the year to prevent excessive run-off or floods. At times when there is an unusual amount of rainfall, and in the early spring, the water drains into the streams very rapidly and causes a flood of short duration.

There are towns, villages, and farms all along the course of this stream and its tributaries, which depend on it for a domestic and industrial water supply. The Canadian Pacific Railway is a large consumer. The town of Estevan has established a water works system, and at Weyburn several dams store water from Souris River. In North Dakota it has been proposed to divert water for irrigation purposes.

The season of 1915 was noticeably deficient in precipitation over much of this drainage area. It is believed that no water ran into the dams at Weyburn during the year. The completion of drainage works in North Dakota during the year released some water previously accumulated in river flats in that state, and this appears in the run-off at Melita.

It is believed that North Antler or Gainsborough Creek discharged no water into Souris River, and that South Antler and Graham Creeks had a small discharge in 1915.

## LONG CREEK NEAR ESTEVAN.

*Location.*—On the SE.  $\frac{1}{4}$  Sec. 10, Tp. 2, Rge. 8, W. 2nd Mer., two and one-half miles south of the town of Estevan.

*Records available.*—June 22, 1911, to December 31, 1915.

*Gauge.*—Vertical staff at old section at bridge. Maintained at elevation 83.87 feet during 1911–12; at 83.90 feet in 1913, and at 83.87 feet in 1914–15. Vertical staff above weir used in winter time; zero of staff at elevation of crest. Vertical staff below a beaver dam used June 21 to November 16, 1915; zero elevation 83.20 feet.

*Bench-marks.*—Permanent iron bench-mark, near bridge at old section. Elevation assumed, 100.00 feet. Top of 3-inch stump on left bank 42 feet upstream from last gauge mentioned. Elevation, 93.15 feet.

*Channel.*—Permanent.

*Discharge measurements.*—By wading at new section or by weir.

*Winter flow.*—By two-foot rectangular weir.

*Observer.*—Geo. Pawson.

### DISCHARGE MEASUREMENTS of Long Creek near Estevan, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Fect.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>
Jan. 18.	F. R. Steinberger.					1.56 <i>d</i>
Feb. 23.	E. W. W. Hughes.				0.32 <i>a</i>	1.16 <i>d</i>
Mar. 9.	do				0.35 <i>a</i>	1.33 <i>d</i>
Mar. 24.	do				0.54 <i>a</i>	2.50 <i>d</i>
April 24.	do				2.18 <i>b</i>	4.80 <i>d</i>
June 21.	F. K. Beach.	2.3	1.15	0.85	0.96 <i>c</i>	0.98
Aug. 9.	do	2.3	1.13	0.54	0.89 <i>c</i>	0.61
Aug. 31.	do				0.82 <i>c</i>	0.11 <i>d</i>
Oct. 1.	do	2.3	1.08	0.48	0.97 <i>c</i>	0.52
Nov. 16.	F. R. Steinberger.				0.27 <i>a</i>	0.91 <i>d</i>
Dec. 6.	do				0.24 <i>a</i>	0.76 <i>d</i>
Dec. 21.	do				0.23 <i>a</i>	0.72 <i>d</i>

*a* Weir gauge.

*b* Gauge at bridge.

*c* Gauge below beaver dam.

*d* Weir measurement.

### DAILY GAUGE HEIGHT AND DISCHARGE of Long Creek near Estevan, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Fect.</i>	<i>Sec.-ft.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>	<i>Fect.</i>	<i>Sec.-ft.</i>
1.	0.31 <i>b</i>	1.11	0.20	0.58	0.35	1.33	0.46	1.98	0.50	2.24	0.14	0.34
2.	0.32	1.17	0.20	0.58	0.35	1.33	0.46	1.98	0.50	2.24	0.12	0.27
3.	0.33	1.22	0.21	0.63	0.36	1.39	0.50	2.24	0.50	2.24	0.10	0.21
4.	0.35	1.33	0.20	0.58	0.37	1.44	0.52	2.37	0.50	2.24	0.10	0.21
5.	0.37	1.44	0.29	1.01	0.37	1.44	0.52	2.37	0.54	2.50	0.20	0.58
6.	0.35	1.33	0.29	1.01	0.36	1.39	0.55	2.57	0.46	1.98	0.35	1.33
7.	0.35	1.33	0.29	1.01	0.36	1.39	0.56	2.63	0.40	1.62	0.30	1.06
8.	0.35	1.33	0.29	1.01	0.37	1.44		5.00	0.40	1.62	0.25	0.81
9.	0.35	1.33	0.29	1.01	0.36	1.39	0.60 <i>a</i>	4.00	0.36	1.39	0.20	0.58
10.	0.35	1.33	0.28	0.96	0.36	1.39	0.60 <i>a</i>	4.00	0.30	1.06	0.20	0.58
11.	0.36	1.39	0.27	0.91		1.36	0.59 <i>a</i>	3.75	0.30	1.06	0.15	0.38
12.	0.35	1.33	0.29	1.01	0.35	1.33	0.55 <i>a</i>	3.25	0.25	0.81	0.10	0.21
13.	0.34	1.28	0.30	1.06	0.35	1.33	0.55 <i>a</i>	3.00	0.20	0.58	0.10 <i>b</i>	0.21
14.	0.34	1.28	0.30	1.06	0.35	1.33	0.50 <i>a</i>	2.75	0.20	0.58	2.14 <i>c</i>	0.30
15.	0.34	1.28	0.30	1.06	0.35	1.33	0.50 <i>a</i>	2.75	0.40	1.62	2.17	0.40
16.	0.33	1.22	0.29	1.01	0.35	1.33	0.50 <i>a</i>	2.75	0.50	2.24	2.17	0.50
17.	0.34	1.28	0.28	0.96	0.35	1.33	0.60 <i>a</i>	3.50	0.47	2.04	2.20	0.60
18.	0.34	1.28	0.28	0.96	0.34	1.28	0.62 <i>a</i>	4.00	0.40	1.62	2.20	0.70
19.	0.32	1.17	0.29	1.01	0.35	1.33	0.63 <i>a</i>	4.50	0.35	1.33	2.20	0.80
20.	0.27	0.91	0.30	1.06	0.35	1.33	0.50 <i>a</i>	2.75	0.30	1.06	2.20 <i>c</i>	0.90
21.	0.27	0.91	0.30	1.06	0.40	1.62	0.45 <i>a</i>	2.25	0.27	0.91	0.97 <i>d</i>	1.02
22.	0.24	0.76	0.31	1.11	0.42	1.74	0.45 <i>a</i>	2.25	0.25	0.81	0.99	1.08
23.	0.22 <i>a</i>	0.85	0.32	1.17	0.44	1.86	0.45 <i>a</i>	2.25	0.22	0.67	1.01	1.13
24.	0.29	1.01	0.33	1.22	0.64 <i>a</i>	4.00	0.50 <i>a</i>	2.75	0.22	0.67	0.98	1.04
25.	0.29	1.01	0.34	1.28	0.48 <i>a</i>	2.50	0.85 <i>a</i>	5.25	0.24	0.76	0.97	1.00
26.	0.29	1.01	0.34	1.28	0.44 <i>a</i>	2.20	0.75	4.00	0.19	0.54	0.95	0.94
27.	0.23	0.72	0.34	1.28	0.44	1.86	0.70	3.63	0.25	0.81	0.96	0.97
28.	0.24	0.76		1.30	0.48	2.11	0.65	3.26	0.24	0.76	0.95	0.93
29.	0.21	0.63			0.44	1.86	0.60	2.91	0.20	0.58	0.97	0.99
30.	0.24	0.76			0.40	1.62	0.55	2.57	0.20	0.58	0.90 <i>d</i>	0.78
31.	0.21	0.63			0.46	1.98			0.18	0.50		

*a* Some water escaped around weir. Discharge estimated.

*b* to *b* Head on 2 foot weir.

*c* to *c* Gauge at bridge affected by beaver dam

*d* to *d* Shifting conditions.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Long Creek near Estevan, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	0.92b	0.83	0.93	0.76	0.82	0.10	0.97	0.53	1.00	0.62	0.24	0.76
2.	0.93	0.86	0.88	0.60	0.76	0.02	0.95	0.47	0.98	0.56	0.24	0.76
3.	0.95	0.92	0.88	0.60	0.77	0.03	0.95	0.47	1.00	0.62	0.24	0.76
4.	0.97	0.97	0.85	0.52	0.78	0.04	0.95	0.47	1.01	0.66	0.25	0.81
5.	0.98	1.00	0.87	0.57	0.84	0.15	0.94	0.44	1.01	0.66	0.23	0.72
6.	0.93	0.84	0.89	0.63	0.81	0.09	0.95	0.47	1.02	0.70	0.24	0.76
7.	0.93	0.84	0.88	0.60	0.83	0.12	0.95	0.47	1.05	0.80	0.25	0.81
8.	0.93	0.84	0.88	0.60	0.84	0.15	0.95	0.47	1.15	1.17	0.26	0.86
8.	0.93	0.84	0.88	0.60	0.86	0.20	0.95	0.47	1.14	1.13	0.27	0.91
10.	1.02	1.12	0.86	0.52	0.84	0.15	0.96	0.50	1.14	1.13	0.29	1.01
11.	1.08	1.32	0.85	0.48	0.86	0.20	0.94	0.44	1.10	0.98	0.25	0.81
12.	1.20	1.80	0.84	0.44	0.89	0.29	0.95	0.47	1.08	0.91	0.25	0.81
13.	1.15	1.58	0.83	0.39	0.89	0.29	0.96	0.50	1.06	0.84	0.22	0.67
14.	1.05	1.20	0.85	0.42	0.91	0.35	0.98	0.56	1.05	0.80	0.18	0.50
15.	1.03	1.13	0.81	0.30	0.93	0.41	0.98	0.56	1.05	0.80	0.20	0.58
16.	1.01	1.06	0.79	0.23	0.94	0.44	0.97	0.53	1.05	0.80	0.17	0.46
17.	1.00	1.03	0.77	0.18	0.95	0.47	0.96	0.50	0.28a	0.96	0.18	0.50
18.	1.03	1.12	0.76	0.14	0.97	0.53	0.97	0.53	0.34	1.28	0.18	0.50
19.	1.00	1.02	0.84	0.32	0.93	0.41	0.96	0.50	0.34	1.28	0.19	0.54
20.	0.98	0.95	0.84	0.31	0.91	0.35	0.96	0.50	0.34	1.28	0.22	0.67
21.	0.97	0.92	0.84	0.29	0.85	0.18	0.96	0.50	0.30	1.06	0.23	0.72
22.	0.93	0.79	0.85	0.30	0.91	0.35	0.96	0.50	0.30	1.06	0.24	0.76
23.	0.95	0.85	0.83	0.24	0.90	0.32	0.97	0.53	0.28	0.96	0.26	0.86
24.	0.96	0.87	0.87	0.32	0.90	0.32	0.96	0.50	0.30	1.06	0.25	0.81
25.	0.94	0.81	0.84	0.23	0.91	0.35	0.95	0.47	0.30	1.06	0.23	0.72
26.	0.93	0.78	0.87	0.30	0.91	0.35	0.97	0.53	0.30	1.06	0.23	0.72
27.	0.93	0.78	0.84	0.21	0.91	0.35	0.99	0.59	0.30	1.06	0.25	0.81
28.	0.95	0.84	0.85	0.22	0.93	0.41	0.99	0.59	0.29	1.01	0.24	0.76
29.	0.93	0.77	0.88	0.28	0.93	0.41	1.00	0.62	0.28	0.96	0.25	0.81
30.	0.94	0.80	0.85	0.17	0.99	0.59	1.00	0.62	0.24	0.76	0.25	0.81
31.	0.93	0.76	0.83b	0.12	.....	.....	1.00	0.62	.....	.....	0.25a	0.81

a to a Head on 24-inch weir.

b to b Shifting conditions.

## MONTHLY DISCHARGE of Long Creek near Estevan, for 1915.

(Drainage area 1,380 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	1 44	0 63	1 11	0 000805	0 0009	68
February	1 30	0 58	1 01	0 000732	0 0008	56
March	4 00	1 28	1 63	0 001181	0 0014	100
April	5 25	1 98	3 11	0 002254	0 0025	185
May	2 50	0 50	1 28	0 000928	0 0011	79
June	1 33	0 21	0 70	0 000507	0 0006	42
July	1 80	0 76	0 98	0 000710	0 0008	60
August	0 76	0 12	0 38	0 000275	0 0003	23
September	0 50	0 02	0 28	0 000203	0 0002	17
October	0 62	0 44	0 53	0 000370	0 0004	31
November	1 28	0 56	0 91	0 000974	0 0007	55
December	1 01	0 46	0 74	0 000536	0 0006	46
The year					0 0103	762

## SOURIS RIVER NEAR ESTEVAN

Location.—On the N.E. ¼ Sec. 11, Tp. 2, Rge. S, W. 2nd Mer., near the pumping plant of the Canadian Pacific Railway.

Records available.—June 23, 1911, to December 31, 1915.

*Gauge.*—Staff. Zero elevation of gauge was maintained at 82.45 feet during 1911-12; zero elevation of gauge was maintained at 82.55 feet during 1913-15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Subject to debris on control.

*Discharge measurements.*—From bridge about one mile upstream, by wading at gauge, or by weir.

*Winter flow.*—Affected by ice. Permanent weir used winter of 1914-15.

*Observer.*—W. Bevan.

### DISCHARGE MEASUREMENTS of Souris River near Estevan, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 18	F. R. Steinberger					0.91a
Feb. 23	E. W. Hughes				0.99	0.58a
Mar. 9	do				1.09	0.96a
Mar. 24	do	12.3	8.20	0.45	1.70	3.80
April 24	do	6.1	2.40	1.50	1.01	3.60
June 21	F. K. Beach	8.0	1.62	0.47	0.66	0.76
Aug. 9	do				0.60	0.33a
Aug. 31	do				0.49	0.01a
Oct. 1	do				0.47	0.05a
Nov. 15	F. R. Steinberger				0.50	0.04a
Nov. 16	do				0.06b	0.05a
Dec. 6	do				0.64	0.74a
Dec. 21	do				0.76	0.76a

a Weir measurement.

b Weir gauge.

### DAILY GAUGE HEIGHT AND DISCHARGE of Souris River near Estevan, for 1915.

DAY.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0.28a	0.96	0.33a	1.22	0.28a	0.96	2.00b	2.60	0.96b	3.00	0.76b	1.18
2	0.28	0.96	0.33	1.22	0.29	1.01	1.90	2.10	0.96	3.00	0.76	1.18
3	0.29	1.01	0.33	1.22	0.28	0.96	1.90	2.20	0.92	2.50	0.76	1.18
4	0.29	1.01	0.33	1.22	0.28	0.96	1.92	2.30	0.90	2.30	0.76	1.18
5	0.29	1.01	0.33	1.22	0.27	0.92	1.92	2.40	0.88	2.10	0.84	1.76
6	0.28	0.96	0.33	1.22	0.29	1.01	1.95	2.60	0.88	2.10	0.89	2.20
7	0.30	1.06	0.38	1.50	0.30	1.06	1.96	2.70	0.86	1.90	0.91	2.40
8	0.30	1.06	0.38	1.50	0.30	1.06	1.96	2.80	0.86	1.90	0.81	1.50
9	0.30	1.06	0.38	1.50	0.28	0.96	1.96	2.00	0.85	1.84	0.81	1.50
10	0.31	1.11	0.65a	2.80	0.28	0.96	1.96	3.00	0.85	1.84	0.78	1.30
11	0.30	1.06	1.96b	5.60	0.27	0.91	1.94	2.90	0.86	1.90	0.78	1.30
12	0.30	1.06	2.00	5.90	0.25	0.81	1.94	3.00	0.86	1.90	0.78	1.30
13	0.30	1.06	1.80	4.45	0.25	0.81	1.90	2.90	0.86	1.90	0.73	1.00
14	0.31	1.11	1.72	3.90	0.25	0.81	1.90	3.00	0.86	1.90	0.70	0.82
15	0.31	1.11	1.60b	3.20	0.25	0.81	1.90	3.00	0.87	2.00	0.67	0.70
16	0.30	1.06	0.50a	2.24	0.25	0.81	1.90	3.10	0.87	2.00	0.65	0.60
17	0.30	1.06	0.43	1.80	0.40	1.62	1.90	3.20	0.90	2.30	0.65	0.60
18	0.29	1.01	0.36	1.39	0.45	1.92	1.91	3.30	0.90	2.30	0.62	0.47
19	0.29	1.01	0.30	1.06	0.48	2.11	1.92	3.40	0.92	2.50	0.62	0.47
20	0.29	1.01	0.27	0.91	0.50a	2.24	1.92	3.50	0.85	1.84	0.65	0.60
21	0.29	1.01	0.27	0.91	1.50b	2.56	1.90	3.40	0.85	1.84	0.66	0.65
22	0.28	0.96	0.27	0.91	1.56	2.93	1.92	3.60	0.85	1.84	0.67	0.69
23	0.28	0.96	0.26	0.86	1.60	3.18	1.90	3.50	0.85	1.84	0.67	0.69
24	0.28	0.96	0.26	0.86	1.68	3.60	1.90c	3.60	0.86	1.90	0.65	0.60
25	0.28	0.96	0.25	0.81	1.70	3.80	1.02	3.80	0.85	1.84	0.66	0.65
26	0.28	0.96	0.25	0.81	1.70	3.80	1.00	3.50	0.85	1.84	0.66	0.65
27	0.28	0.96	0.25	0.81	1.65	3.50	1.00	3.50	0.82	1.58	0.66	0.65
28	0.28	0.96	0.25a	0.81	1.65	3.50	0.98	3.20	0.80	1.42	0.65	0.60
29	0.28	0.96			1.58	3.00	0.96	3.00	0.78	1.30	0.65	0.60
30	0.28	0.96			1.50	2.56	0.96b	3.00	0.77	1.24	0.70b	0.82
31	0.28a	0.96			1.50b	2.56			0.77b	1.24		

a to a Head on 24-inch weir.

b to b Gauge height.

c Debris cleared from control after observation. Shifting conditions April 1 to 24.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Souris River near Estevan, for 1915.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1	0.70	0.82	0.60	0.39	0.48	0.01	0.47	0.05	0.48	0.04	0.64	0.75
2	0.70	0.82	0.59	0.36	0.49	0.01	0.47	0.05	0.49	0.04	0.64	0.75
3	0.71	0.88	0.58	0.32	0.49	0.01	0.48	0.06	0.49	0.04	0.64	0.75
4	0.69	0.78	0.55	0.22	0.49	0.01	0.48	0.06	0.49	0.04	0.64	0.75
5	0.68	0.73	0.55	0.22	0.49	0.01	0.47	0.05	0.49	0.04	0.64	0.75
6	0.68	0.73	0.55	0.22	0.49	0.01	0.47	0.05	0.49	0.04	0.64	0.74
7	0.70	0.82	0.55	0.22	0.50	0.05	0.46	0.01	0.49	0.04	0.63	0.70
8	0.70	0.82	0.55	0.22	0.50	0.05	0.46	0.01	0.49	0.04	0.63	0.70
9	0.68	0.73	0.60	0.39	0.50	0.05	0.46	0.01	0.49	0.04	0.62	0.65
10	1.30	8.90	0.60	0.39	0.50	0.05	0.46	0.01	0.49	0.04	0.61	0.60
11	0.90	2.26	0.60	0.39	0.50	0.05	0.47	0.05	0.49	0.04	0.61	0.60
12	0.86	1.92	0.60	0.39	0.50	0.05	0.47	0.05	0.49	0.04	0.61	0.60
13	0.80	1.42	0.60	0.39	0.50	0.05	0.47	0.05	0.50	0.04	0.62	0.65
14	0.76	1.18	0.60	0.39	0.50	0.05	0.47	0.05	0.50	0.04	0.65	0.70
15	0.76	1.18	0.60	0.39	0.50	0.05	0.47	0.05	0.50	0.04	0.67	0.75
16	0.77	1.24	0.60	0.39	0.50	0.05	0.47	0.05	0.60	0.05a	0.70	0.75
17	0.65	0.60	0.60	0.39	0.50	0.05	0.47	0.05	0.64	0.74b	0.76	0.75
18	0.70	0.82	0.60	0.39	0.51	0.05	0.47	0.05	0.66	0.82	0.76	0.75
19	0.75	1.12	0.65	0.60	0.53	0.05	0.47	0.05	0.68	0.90	0.76	0.75
20	0.75	1.12	0.65	0.60	0.53	0.05	0.48	0.05	0.70	1.00	0.76	0.75
21	0.75	1.12	0.60	0.39	0.53	0.05	0.48	0.05	0.71	1.05	0.76	0.76
22	0.75	1.12	0.58	0.32	0.52	0.05	0.48	0.05	0.69	0.95	0.76	0.75
23	0.75	1.12	0.59	0.36	0.52	0.05	0.48	0.05	0.68	0.90	0.76	0.75
24	0.75	1.12	0.54	0.19	0.56	0.05	0.48	0.05	0.68	0.90	0.76	0.75
25	0.65	0.60	0.50	0.05a	0.56	0.05	0.47	0.05	0.67	0.85	0.76	0.75
26	0.65	0.60	0.50	0.05	0.57	0.05	0.47	0.05	0.69	0.95	0.78	0.75
27	0.65	0.60	0.50	0.05	0.57	0.05	0.47	0.05	0.67	0.85	0.80	0.75
28	0.63	0.52	0.50	0.05	0.57	0.05	0.47	0.05	0.67	0.85	0.81	0.75
29	0.63	0.52	0.50	0.05	0.58	0.05	0.47	0.05	0.66	0.80	0.81	0.75
30	0.63	0.52	0.49	0.01	0.58	0.05	0.47	0.05	0.66	0.80	0.79	0.75
31	0.62b	0.47	0.49	0.01	.....	.....	0.48	0.05	.....	.....	0.79	0.75b

a to a Seepage under dam is all that passed gauge.

b to b Ice conditions.

## MONTHLY DISCHARGE of Souris River near Estevan, for 1915.

(Drainage area 4,550 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	1 11	0 96	1.01	000222	0003	62
February	5.90	0 81	1.85	000407	0014	103
March	3.80	0 81	1.86	000410	0005	114
April	3.80	2 10	3.00	000660	0007	179
May	3 00	1 24	1.96	000430	0005	120
June	2 40	0 47	0.99	000218	0002	59
July	8.90	0 47	1.20	000264	0003	74
August	0 60	0 01	0.28	000001	0001	17
September	0 05	0 01	0.04	000009	0000	2
October	0 06	0 01	0.05	000011	0000	3
November	1 05	0 04	0.43	000094	0001	26
December	0 76	0 60	0.72	000158	0002	44
The year.	.....	.....	.....	.....	0033	803

## MOOSE MOUNTAIN CREEK NEAR OXBOW.

Location.—On the NE. ¼ Sec. 15, Tp. 3, Rge. 2, W. 2nd Mer., one mile south and one-half mile west of the Canadian Pacific Railway station at Oxbow.

Records available.—September 4, 1913, to October 31, 1915.

*Gauge.*—Vertical staff. Zero elevation, 91.94 feet from establishment until August 23, 1915, sometimes affected by backwater from Souris River. Vertical staff. Zero elevation, 92.31 feet August 24, 1915, to October 31, 1915.

*Bench-marks.*—On stump of tree, fifty feet upstream from first gauge, painted white. Assumed elevation, 100.00 feet. Spike in tree on right bank at second gauge. Elevation, 98.84 feet.

*Channel.*—Permanent.

*Discharge measurements.*—By wading near first gauge or from bridge one-quarter mile upstream.

*Winter flow.*—No winter observations have been taken.

*Observer.*—W. E. Christmas.

#### DISCHARGE MEASUREMENTS of Moose Mountain Creek near Oxbow, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 25.....	E. W. W. Hughes.....					Nil.
April 27.....	do.....	25.5	12.20	0.81	1.29	9.90
June 18.....	F. K. Beach.....	16.0	6.30	1.61	1.22	10.20
Aug. 10.....	do.....	2.0	0.27	0.20	0.91	0.05
Sept. 1, 2.....	do.....				0.47	0.01
Oct. 2.....	do.....				0.68a	0.01
					0.64a	0.00b

a New gauge.

b Small flow, too small to measure.

#### DAILY GAUGE HEIGHT AND DISCHARGE of Moose Mountain Creek near Oxbow, for 1915.

DAY.	March.		April.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		Nil.	0.95	1.00
2.....		"	1.06	2.00
3.....		"	1.10	3.00
4.....		"	1.03	3.00
5.....		"	1.04	4.00
6.....		"	1.03	5.00a
7.....		"	1.03	5.90
8.....		"	1.12	7.40
9.....		"	1.15	7.90
10.....		"	1.14	7.70
11.....		"	1.45	15.50
12.....		"	1.45	15.50
13.....		"	1.38	13.20
14.....		"	1.36	12.70
15.....		"	1.39	13.50
16.....		"	1.40	13.80
17.....		"	1.35	12.40
18.....		"	1.34	12.10
19.....		"	1.35	12.40
20.....		"	1.30	11.00
21.....		" b	1.33	11.80
22.....	1.82	1.00a	1.27	10.30
23.....	1.62	1.00	1.26	10.10
24.....	1.42	Nil.	1.30	11.00
25.....	1.42	"	1.31	11.30
26.....	1.18	"	1.29	10.80
27.....	1.28	0.50	1.28	10.60
28.....	1.21	Nil.	1.23	9.50
29.....	1.23	"	1.22	9.20
30.....	0.95	"	1.20	8.80
31.....	0.85	"		

a to a Ice conditions.

b Observer reports no flow previous to this date.



## SESSIONAL PAPER No. 25c

 DAILY GAUGE HEIGHT AND DISCHARGE of Moose Mountain Creek near Oxbow, for 1915.  
 —Concluded.

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1.19	8.60	1.03	5.90	1.00	5.40	1.05	4.20	0.70	0.01	0.65	0.01
2	1.15	7.90	1.01	5.60	0.96	4.80	1.03	3.70	0.69	0.01	0.64	0.00
3	1.14	7.70	1.00	5.40	0.97	5.00	1.03	3.20	0.68	0.01	0.64	0.00
4	1.13	7.50	1.10	7.00	0.94	4.60	1.01	2.70	0.68	0.01	0.64	0.00
5	1.13	7.50	1.26	10.10	0.87	3.60	0.98	2.20	0.65	0.01	0.63	0.00
6	1.12	7.40	1.21	9.00	0.83	3.20	0.97	1.70	0.68	0.01	0.62	0.00
7	1.16	8.10	1.21	9.00	0.79	2.70	0.97	1.20	0.68	0.01	0.62	0.01
8	1.16	8.10	1.18	8.40	0.83	3.20	0.95	0.70	0.68	0.01	0.62	Nd
9	1.14	7.70	1.16	8.10	0.89	3.90	0.94	0.20	0.65	0.01	0.62	"
10	1.21	9.00	1.26	10.10	1.07	6.50	0.92	0.05	0.68	0.01	0.62	"
11	1.14	7.70	1.25	9.90	1.34	12.10	0.90	0.04	0.67	0.01	0.62	"
12	1.13	7.50	1.24	9.70	1.26	10.10	0.90	0.04	0.68	0.01	0.62	"
13	1.15	7.90	1.21	9.00	1.50	17.20	0.88	0.04	0.69	0.01	0.61	"
14	1.15	7.90	1.21	9.00	1.35	12.40	0.87	0.04	0.69	0.01	0.61	"
15	1.27	10.30	1.22	9.20	1.29	10.80	0.86	0.04	0.69	0.01	0.61	"
16	1.28	10.60	1.25	9.90	1.30	11.00	0.80	0.03	0.68	0.01	0.61	"
17	1.27	10.30	1.22	9.20	1.41	14.10	0.77	0.03	0.67	0.01	0.61	"
18	1.23	9.50	1.20	8.80	1.39	13.50	0.75	0.03	0.66	0.01	0.61	"
19	1.24	9.70	1.19	8.60	1.34	12.10	0.71	0.03	0.66	0.00	0.61	"
20	1.24	9.70	1.20	8.80	1.30	11.00	0.75	0.03	0.66	0.00	0.61	"
21	1.22	9.20	1.22	9.20	1.25	9.90	0.73	0.02	0.66	0.01	0.61	"
22	1.19	8.60	1.15	7.90	1.25	9.90	0.72	0.02	0.65	0.00	0.61	"
23	1.17	8.30	1.17	8.30	1.29	10.80	0.69a	0.02	0.65	0.00	0.61	"
24	1.17	8.30	1.18	8.40	1.16	8.10	0.71b	0.02	0.65	0.00	0.61	"
25	1.16	8.10	1.15	7.90	1.15	7.90	0.71	0.02	0.65	0.00	0.61	"
26	1.11	7.20	1.25	9.90	1.11a	7.20	0.70	0.01	0.65	0.00	0.61	"
27	1.17	8.30	1.16	8.10	1.10	6.70	0.70	0.01	0.65	0.01	0.60	"
28	1.17	8.30	1.08	6.70	1.08	6.20	0.71	0.02	0.65	0.00	0.60	"
29	1.12	7.40	1.07	6.50	1.08	5.70	0.70	0.01	0.65	0.00	0.60	"
30	1.12	7.40	1.03	5.90	1.07	5.20	0.69	0.01	0.65	0.00	0.60	"
31	1.09	6.80			1.07	4.70	0.69	0.01			0.60b	"

a to a Affected by backwater from Souris River, caused by dam.

b to b New gauge not affected by backwater.

## MONTHLY DISCHARGE of Moose Mountain Creek near Oxbow, for 1915

(Drainage area 2,953 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum.	Minimum	Mean.	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March	1 00	Nd	0 08	00003	0000	3
April	15 50	1 00	9 40	00318	0036	559
May	10 60	6 80	8 30	00280	0032	510
June	10 10	5 40	8 30	00280	0031	494
July	17 20	2 70	8 00	00270	0031	492
August	4 20	0 01	0 60	00020	0002	41
September	0 01	0 00	0 01	00000	0000	Nd
October	0 01	Nd	0 00	00000	0000	3
The period					0133	2,111

NOTE.—It is believed that no discharge occurred in January or February.



## SOURIS RIVER NEAR GLEN EWEN.

*Location.*—On the NE.  $\frac{1}{4}$  Sec. 36, Tp. 2, Rge. 1, W. 2nd Mer., two miles south and one mile east of Canadian Pacific Railway station at Glen Ewen.

*Records available.*—June 26, 1911, to October 31, 1915.

*Gauge.*—Vertical staff. Zero maintained at elevation of 79.32 feet during 1911, and at 78.98 feet during 1912–15.

*Bench-mark.*—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

*Channel.*—Affected by beaver dams and debris on control.

*Discharge measurements.*—By wading at ford, one-quarter mile below gauge or from bridge one mile above gauge.

*Winter flow.*—No observations have been taken.

*Observer.*—D. F. Preston.

## DISCHARGE MEASUREMENTS of Souris River near Glen Ewen, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
Mar. 25.....	E. W. W. Hughes.....				2.32	Nil.
April 26.....	do.....	50.0	35.0	0.57	1.95	19.90
June 18.....	F. K. Beach.....	42.5	27.0	0.59	2.03	16.20
Aug. 10.....	do.....	15.7	5.0	0.74	1.62	3.70
Sept. 1.....	do.....	15.2	3.2	0.33	1.51	1.05
Oct. 2.....	do.....	35.0	14.0	0.08	1.67	1.06

## DAILY GAUGE HEIGHT AND DISCHARGE of Souris River near Glen Ewen, for 1915.

DAY.	March.		April.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....		Nil.	2.12	1.00
2.....		"	2.05	1.00
3.....		"	2.05	1.00
4.....		"	2.09	1.50
5.....		"	2.11	2.00
6.....		"	2.12	2.50
7.....		"	2.14	3.00
8.....		"	2.19	5.00
9.....		"	2.25	7.00
10.....		"	2.19	10.00
11.....		"	2.02a	20.00
12.....		"	2.08	25.00
13.....		"	2.22	41.00
14.....		"	2.24	44.00
15.....		"	2.12	29.00
16.....		"	2.01	19.60
17.....		"	2.02	20.00
18.....		"	2.01	19.60
19.....		"	1.99	18.20
20.....		" b	1.97	17.20
21.....	2.14a	0.10	1.97	17.20
22.....	2.34	0.20	1.96	16.60
23.....	2.28	0.10	1.94	15.50
24.....	2.29	Nil.	1.93	15.00
25.....	2.31	"	1.94	15.50
26.....	2.30	"	1.95	16.00
27.....	2.38	1.00	1.95	16.00
28.....	2.36	1.00	1.92	14.40
29.....	2.34	1.00	1.89	12.90
30.....	2.34	1.00	1.88	12.50
31.....	2.19	1.00		

a to a Ice conditions.

b Observer reports no flow previous to this date.

## SESSIONAL PAPER No. 25c

DAILY GAUGE HEIGHT AND DISCHARGE of Souris River near Glen Ewen, for 1915.—*Concluded.*

DAY.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	1.89	12.90	1.87	12.10	1.86	11.70	1.79	9.00	1.52	1.05	1.66	1.06
2.	1.87	12.10	1.85	11.30	1.85	11.30	1.77	8.30	1.52	1.05	1.66	1.06
3.	1.86	11.70	1.83	10.50	1.84	10.90	1.75	7.60	1.53	1.05	1.70	1.06
4.	1.84	10.90	1.91	13.80	1.83	10.50	1.73	7.00	1.54	1.05	1.70	1.06
5.	1.82	10.10	1.89	12.90	1.80	9.30	1.70	6.00	1.55	1.05	1.70	1.06
6.	1.82	10.10	1.91	13.80	1.82	10.10	1.69	5.70	1.55	1.05	1.72	1.06
7.	1.80	9.30	1.98	17.70	1.78	8.60	1.67	5.20	1.56	1.05	1.73	1.06
8.	1.79	9.00	1.96	16.60	1.84	10.90	1.65	4.60	1.57	1.05	1.74	1.06
9.	1.80	9.30	2.00	18.80	1.78	8.60	1.63	4.10	1.57	1.05	1.74	1.06
10.	1.84	10.90	2.00	18.80	1.74	7.30	1.62	3.80	1.57	1.05	1.75	1.06
11.	1.84	10.90	2.01	19.60	1.71	6.30	1.61	3.60	1.56	1.05	1.75	1.06
12.	1.86	11.70	2.02	20.00	1.75	7.60	1.60	3.30	1.58	1.05	1.75	1.06
13.	1.84	10.90	2.03	21.00	1.89	12.90	1.60	3.30	1.61	1.05	1.76	1.06
14.	1.81	9.70	1.97	17.20	2.51	92.00	1.58	2.80	1.63	1.05	1.77	1.06
15.	1.90	13.30	1.94	15.50	2.36	63.00	1.57	2.60	1.60	1.05	1.78	1.06
16.	1.93	15.00	1.96	16.60	2.35	61.00	1.56	2.30	1.59	1.05	1.79	1.06
17.	1.98	17.70	1.96	16.60	2.25	45.00	1.56	2.30	1.58	1.05	1.79	1.06
18.	1.97	17.20	2.03	21.00	2.30	52.00	1.56	2.30	1.56	1.05	1.79	1.06
19.	1.95	16.00	2.03	21.00	2.37	64.00	1.56	2.30	1.55	1.05	1.81	1.06
20.	1.93	15.00	2.05	23.00	2.34	59.00	1.62	3.80	1.56	1.05	1.83	1.06
21.	1.96	16.60	2.00	18.80	2.29	51.00	1.62	3.80	1.57	1.05	1.90	1.06
22.	1.95	16.00	2.05	23.00	2.10	27.00	1.62	3.80	1.57	1.05	1.91	1.06
23.	1.93	15.00	2.03	21.00	2.06	24.00	1.61	3.60	1.56	1.05	1.81	1.06
24.	1.91	13.80	1.99	18.20	2.03	21.00	1.60	3.30	1.60	1.06	1.82	1.06
25.	1.88	12.50	1.95	16.00	2.00	18.80	1.56	2.30	1.61	1.06	1.84	1.06
26.	1.87	12.10	2.04	22.00	1.96	16.60	1.55	2.00	1.63	1.06	1.85	1.06
27.	1.91	13.80	2.03	21.00	1.92	14.40	1.55	2.00	1.65	1.06	1.86	1.06
28.	1.90	13.30	2.01	19.60	1.94	15.50	1.54	1.80	1.66	1.06	1.85	1.06
29.	1.93	15.00	1.97	17.20	1.95	16.00	1.52	1.30a	1.66	1.06	1.85	1.06
30.	1.92	14.40	1.90	13.30	1.86	11.70	1.52	1.20	1.65	1.06	1.85	1.06
31.	1.87	12.10			1.80	9.30	1.52	1.10			1.86	1.06a

a to a Seepage only from dam at Oxbow. Fluctuations of gauge height due to leaves on control and to beavers.

## MONTHLY DISCHARGE of Souris River near Glen Ewen, for 1915.

(Drainage area 7,500 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
March	1.00	Nil.	0.17	0.00002	0.0000	10
April	44.00	1.00	14.60	0.00195	0.0022	869
May	17.70	9.00	12.80	0.00171	0.0020	787
June	23.00	10.50	17.60	0.00235	0.0026	1,047
July	92.00	6.30	25.00	0.00333	0.0038	1,537
August	9.00	1.10	3.70	0.00049	0.0006	303
September	1.06	1.05	1.05	0.00014	0.0002	62
October	1.06	1.06	1.06	0.00014	0.0002	65
The period					0.0116	4,580

NOTE.—It is believed that there was no discharge during January or February.

## SOURIS RIVER AT MELITA.

Location.—On the SW.  $\frac{1}{4}$  Sec. 6, Tp. 4, Rge. 26, W. 1st Mer., at a highway bridge in a park, about one mile east of the Canadian Pacific Railway station at Melita.

Records available.—July 20, 1911, to July 31, 1915.

Gauge.—Vertical staff. Elevation of zero maintained at 84.45 feet since establishment.

Bench-mark.—Permanent iron bench-mark. Assumed elevation, 100.00 feet.

Channel.—Permanent.  
Discharge measurements.—With meter from bridge, or in times of very low water at a shallow section one thousand feet south of bridge and about one mile upstream by river.  
Winter flow.—No records have been taken.  
Observer.—W. Kay.  
Other records.—A station has been established by the Manitoba Hydrographic Surveys at this point and records have been continued by them, since the discontinuance by this office of this station. Zero of their gauge elevation 84.44 feet (our datum), referred to iron benchmark 58 feet upstream from left end of bridge; elevation 98.86 feet (our datum), and to a benchmark, spike in stump, 69 feet upstream from right end of bridge, elevation 98.01 feet (our datum).

DISCHARGE MEASUREMENTS of Souris River at Melita, in 1915.

Date.	Engineer.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
		<i>Feet.</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
April 27.....	E. W. W. Hughes.....	82.0	172	0.59	1.92	102
June 19.....	F. K. Beach.....	88.0	209	0.60	2.34	126
Sept. 2.....	do.....	42.3 <sup>a</sup>	39	0.35	0.93	14

<sup>a</sup> Measurement made 1 mile upstream.

DAILY GAUGE HEIGHT AND DISCHARGE of Souris River at Melita, for 1915.

DAY.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	2.36	133	1.61	64	0.91	15.5	0.85	13.0
2.....	2.61	159	1.64	67	0.81	11.4	0.80	11.0
3.....	2.76	176	1.41	49	0.66	5.8	0.72	7.8
4.....	2.96	199	1.51	56	0.78	10.2	0.68	6.4
5.....	3.26	237	1.24	37	0.71	7.4	0.56	3.2
6.....	3.31	243	1.22	35	0.69	6.7	1.50	55.0
7.....	3.33	246	1.20	34	0.68	6.4	1.52	57.0
8.....	3.36	250	1.48	54	0.71	7.4	1.55	59.0
9.....	3.22	232	1.61	64	0.56	3.2	1.60	63.0
10.....	2.96	199	1.76	77	0.51	2.2	1.58	61.0
11.....	2.86	187	1.36	45	0.56	3.2	1.45	52.0
12.....	2.91	193	1.64	67	0.66	5.8	1.37	46.0
13.....	2.76	176	1.71	73	0.56	3.2	1.28	40.0
14.....	2.56	154	1.92	92	0.61	4.3	1.29	40.0
15.....	2.20	117	1.50	55	0.76	9.4	1.12	28.0
16.....	1.65	67	1.91	91	0.80	11.0	1.15	30.0
17.....	2.04	103	1.81	82	0.86	13.4	1.18	33.0
18.....	1.86	86	1.90	90	2.81	181.0	1.16	31.0
19.....	1.65	67	1.81	82	2.35	132.0	1.12	28.0
20.....	1.71	73	1.70	72	2.06	104.0	1.08	26.0
21.....	1.93	93	1.61	64	1.85	85.0	1.10	27.0
22.....	1.81	82	1.75	76	1.75	76.0	1.07	25.0
23.....	1.36	45	1.78	79	1.45	52.0	1.15	30.0
24.....	1.51	56	1.71	73	1.08	26.0	1.00	20.0
25.....	1.46	53	1.64	67	1.60	63.0	0.95	17.5
26.....	1.75	76	1.66	68	1.55	59.0	0.90	15.0
27.....	1.91	91	1.92	92	1.50	55.0	0.89	14.6
28.....	1.51	56	1.76	77	1.35	45.0	0.84	12.6
29.....	1.32	42	1.36	45	1.15	30.0	0.79	10.6
30.....	1.48	54	1.06	24	1.00	20.0	0.75	9.0
31.....			0.94	17			0.70	7.0 <sup>a</sup>

<sup>a</sup> Station discontinued.

## SESSIONAL PAPER No. 25c

## MONTHLY DISCHARGE of Souris River at Melita, for 1915.

(Drainage area 10,673 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
April.....	250	42.0	132	0.0124	0.013	7,855
May.....	92	17.0	63	0.0059	0.007	3,874
June.....	181	2.2	35	0.0033	0.003	2,083
July.....	63	3.2	28	0.0026	0.003	1,722
The period.....					0.026	15,534

NOTE.—Run-off during 1915 has been enhanced by the discharge of works draining river bottoms in the state of North Dakota.

## MISCELLANEOUS DISCHARGE MEASUREMENTS made in Souris River drainage basin. in 1915.

Date.	Engineer.	Stream.	Location.	Width.	Area of Section.	Mean Velocity.	Discharge.
				Feet.	Sq. ft.	Ft. per sec.	Sec.-ft.
Feb. 22....	E. W. W. Hughes..	Souris River.....	Weyburn.....				No.
Mar. 9....	do ..	do .....	do .....				"
Mar. 24....	do ..	do .....	do .....				"
April 23....	do ..	do .....	do .....				"
June 22....	F. K. Beach.....	do .....	do .....				"
Sept. 2....	do .....	Graham Creek....	SW. 1-4-27-1....				"
Sept. 3....	do .....	South Antler Creek	NW. 22-2-27-1....				"
Sept. 3....	do .....	North Antler Creek	SW. 33-2-27-1....				"
		(Gainsborough)					
Sept. 4....	do .....	Souris River.....	Weyburn.....				"
Oct. 28....	F. R. Steinberger..	do .....	do .....				"
Dec. 6....	do .....	do .....	do .....				"
Dec. 21....	do .....	do .....	do .....				"



## APPENDIX No. 1

### REPORT OF O. H. HOOVER, B.A.Sc., DISTRICT HYDROMETRIC ENGINEER, FOR THE YEAR 1915.

#### *Introduction.*

In this report I have intended to cover in a concise manner the office and field work as performed, according to districts, as well as suggesting certain recommendations *re* the work of 1916. Special attention is given to my services in the headwaters of the North Saskatchewan River district. A tabulated summary of the season's work is also included.

#### *Office Work.*

From January 19 to April 16, inclusive, I was at the Irrigation Office, Calgary, completing the final computations of stream flow for the Cardston Hydrometric district, calendar year 1914.

#### *Cardston District.*

During the part of January 1 to 18, inclusive, I had charge of the field work in the Cardston Hydrometric district, which includes roughly the square bounded on the south and north by the international boundary and a line joining the towns of Lethbridge and Pincher Creek, respectively. Apart from the Belly and St. Mary Rivers the streams included are small. They however maintain a liberal summer discharge, being fed by snow and ice from the mountains. Irrigation is largely practised in this district, and the measurements on streams of an international character are especially important. During the winter season nine regular gauging stations were maintained. I was relieved from this district by Engineer Degnan on January 18, and returned to Calgary on account of office work.

#### *Banff District.*

On April 17, I left Calgary for Banff relieving Engineer Ritchie of his field Hydrometric duties for eleven days. Concerning the work of this district I have little to say, as the same will be better taken up in Mr. Ritchie's report.

#### *Nordegg District.*

On returning from Banff to Calgary April 29, I received instructions to assume charge of the field work in a new hydrometric district which later became known as the Nordegg district. It includes the North Saskatchewan River and its tributaries west of Rocky Mountain House, and the headwaters of the Brazeau River.

In carrying out the work of this district as much data as possible regarding the run-off was obtained, and in addition a limited time was spent on gaining information which would be of value for power development, and storage for water power. A slight co-operation with the Public Works Department *re* the location of dam sites was also carried out, during the season's work.

#### *Temperature.*

The run-off as regards distribution is materially affected by the temperature of this district. Low temperatures beginning in November and ending in April form snow and ice over the entire area which temporarily stores a large percentage of the precipitated moisture.

#### *Geology.*

Geology has a varied effect on the run-off as the area comprises a foothill as well as a mountainous country. The southwest half of the district may be considered within the outer ranges of the Rocky Mountains. A fair percentage of the higher areas of this portion consists of bare rock, of the limestone and quartzite varieties. The upper slopes are also steep, shedding immediately a very large percentage of the water falling upon them. Coming lower into the valleys the soil changes from a drift or alluvial to a loam, and although these soil depths often appear shallow yet the run-off is materially retarded at these levels. In the foothill area directly west of Rocky Mountain House the soil varies from a sandy and gravelly soil to a clay loam.

*Topography.*

The general topography slightly affects the total run-off but has a marked effect on its distribution. The chief effect on the total run-off is through evaporation. This district containing in all only seven lakes, none of which are larger than two and one-half miles by one mile, the evaporation is therefore not a large factor.

Re the distribution however, very high mountain ranges exist, 10,000 feet being quite a common elevation. These cause the precipitation of large quantities of moisture, and by their storage of ice and snow form the principal reservoirs of the district. The inner ranges, on which are located Peyto Glacier, Howse Pk., Pyramid Mt., Sawback Mt., Mt. Coleman, Mt. Freshfield, and Mt. Walker, are especially well located for the preservation of snow and ice fields. In this area it is the warm west wind as much as the sun's rays that melts the ice. By inspection it was noted that these ranges have a general northwest direction, they also contain large pockets or traverse gorges, and steep eastern slopes, which tend to shelter from the sun's rays as well as from the western wind. The most important ice-fields are those of the Freshfield area and those at the head of Glacier Lake.

*Vegetation.*

A liberal tree growth is supported over practically the entire soil area, notable exceptions being at the Kootenay Plains, and on certain lower flats usually near the stream channels. At different times it was found difficult to locate feed for our pack ponies during a whole day's travel, on account of tree growth.

The trees as a rule are young and consist of evergreens, mainly spruce and pine. Many fires in past years have swept through the country and different stages of tree growth are evident. Many localities are also thickly covered with fallen timber as a result of the fires. The oldest and finest forest growth that came to my attention, was found in the Mistaya River Valley between its mouth and the lower Waterfowl Lake. A large area of the forests of the district is protected by the Dominion Forestry Branch, and known as the Clearwater Forest Reserve. Vegetation through tree growth therefore has a marked retarding effect on the distribution of the run-off.

*Party and Transportation Facilities.*

My entire party consisted of one helper, Edward Matheson; one packer, Tom Wilson, and self. Five pack ponies, and three saddle horses were used for the transport, being the only means of covering the entire district. The Canadian Northern railway runs between Rocky Mountain House and Nordegg, but when once in the district this road is of little use for field work. A waggon road has been constructed by the Forestry Branch up the North Saskatchewan River Valley from Nordegg to the whirlpool, a distance of about fifty miles. The best trails are those which have been constructed by the Dominion Forestry Branch, and these are being rapidly improved and extended each year. A tabulated list of the trails, etc., covered by my party during the year is herewith included:

From.	To.	Distance.	Time of travel.	Condition of trail.
Nordegg	Bighorn River	15 Miles...	5 Hours	Good. Hilly
Bighorn River	Cline River	18 "	6 "	Good. Hilly.
Cline River	Wilson's Ranch	8 "	2½ "	Good, ford Saskatchewan
Wilson's Ranch	Wilson's Creek	18 "	5½ "	Good.
Wilson's Creek	Glacier Lake	15 "	5 "	Fair at low water.
Wilson's Ranch	Careless Creek	12 "	4 "	Good.
Careless Creek	Mistaya River	15 "	6 "	Soft.
Wilson's Ranch	Siffleur River	4 "	1½ "	Good.
Glacier River	Cr. from Howse Pass	8 "	2½ "	Gravel wash.
Mouth Mistaya River	Waterfowl Lakes	15 "	5½ "	Very poor.
Waterfowl Lakes	Near Peyto Lake	11 "	3½ "	Good.
Nordegg	Mouth Shunda Creek	20 "	6 "	Poor.
Shunda Creek	Tp. 20. Rge. 11, W. 5th Mer.	15 "	4½ "	Very poor.
Nordegg	Ram River	12 "	4 "	Very poor.
Nordegg	Stove Creek	15 "	5 "	Good.
Stove Creek	Nelson's cache	6 "	2 "	Good.
Nelson's cache	Mouth S. Brazeau River	28 "	9 "	Fair
Nelson's cache	Chungo Creek	8 "	3 "	Good.
Chungo Creek	Brown Creek	5 "	1½ "	Good.
Stove Creek	Blackstone Creek	23 "	2 Days.	Fair.
Blackstone Creek	Big Brazeau River	14 "	5 Hours	Fair.
Brazeau River	Brazeau Ranger Cabin	5 "	2 "	Good.
Brazeau Ranger Cabin	Isaac Creek	17 "	7 "	Very poor.
Isaac Creek	Brazeau Lake	23 "	2 Days.	Fair.
Brazeau Lake	Upper branches Brazeau River	14 "	5 Hours	Fair.
Upper branches Brazeau River	A point over Cataract pass	15 "	7 "	Extremely poor.
Cataract Pass	Mouth Coral Creek	15 "	5 "	Fair.
Mouth Coral Creek	Mouth Cline River	18 "	7 "	Fair.



*Cable Stations.*

During the season five cable stations were erected. The first of these spans the North Saskatchewan River near Wilson's ranch at about Tp. 40, Rge. 13, W. 5th Mer. This structure is owned by the Forestry Branch and was erected in May under my supervision. The span is about 270 feet and pyramid timber towers carry a one-inch steel cable. This structure was built for transportation purposes as well as stream measurements.

A second cable was placed over the North Saskatchewan River about one mile below the mouth of Shunda Creek at about Tp. 40, Rge. 13, W. 5th Mer., during the latter part of July. This structure required only one tower which was built of twelve-inch round timbers. The span is 300 feet and a three-quarter inch steel cable was used.

Other cables were erected over the following streams:—Bighorn River at about Tp. 39, Rge. 16, W. 5th Mer., Cline River at about Tp. 37, Rge. 18, W. 5th Mer. and Mistaya River at about Tp. 34, Rge. 20, W. 5th Mer. Nine-sixteenths inch cable was used in each case, these spans being less than 150 feet. A cable was also transported to a site on the Siffleur River at about Tp. 35, Rge. 17, W. 5th Mer., but on account of the season ending time did not permit of the erection of this structure.

## NORTH SASKATCHEWAN RIVER.

The North Saskatchewan River is the main drainage channel in the district. Its source is found in the Rocky Mountains at about 52° 30' N. Latitude and 117° 15' W. Longitude, the head of the North Branch. What might be termed a secondary source is the Freshfield ice area, located at about 51° 00' N. Latitude and 117° 00' W. Longitude, the head of the Middle Branch.

The North Branch I was unable to visit, but from the forest rangers I learned that it consisted of a typical high level mountain stream with its steep gradient, rapids and rocky canyons. The Middle Branch was inspected from below the stream entering from Howse Pass. It has a very even gradient during its entire course, it is without falls and very free from rapids. The river bed, however, is notably wide, one-half mile being common I should say, and this appears as an immense gravel wash during low water.

Between the junction of the North and Middle Branches and the Kootenay Plains, the Saskatchewan flows in a northeast and easterly direction. The gradient is quite even though supporting a swift flow, and the channel is generally wide, forming islands at different points. Few rapids affect this portion of the river. At a point about ten miles above the Plains a small whirlpool exists, below and near which is a very narrow point on the river channel, as the same passes through a small rock gap. The water surface width at this point is about 160 feet. Two rivers and about ten creeks enter the Saskatchewan above the Plains. At the Kootenay Plains stream measurements were obtained by means of the cable during the entire season. The discharges varied from 21,176 second-feet on June 27, to 881 second-feet on October 29. The former result was, however, a very abnormal flood discharge and the ordinary annual high water discharge would probably not be more than 10,000 sec.-feet. The drainage basin area at this point is about 836 sq. miles.

Between the Kootenay Plains and the mouth of Shunda Creek the Saskatchewan flows in a north, northeast and easterly direction. The channel varies, being extremely wide in one place and quite narrow in another. More islands are in evidence and some difficult rapids are encountered. The mouth of Shunda Creek takes the Saskatchewan about twelve miles out of the mountains.

Between Shunda Creek and Rocky Mountain House the Saskatchewan flows in an easterly direction and has a fairly even gradient, seldom disturbed by rapids. The stream also follows a straighter course and has a narrower channel with higher banks. About one mile below the mouth of Shunda Creek, at the cable site, stream measurements were obtained during the latter part of the season. A gauge was also established and daily records obtained. Discharges varied from 43,841 sec.-feet on June 27 and 28, to 903 sec.-feet on November 8.

No falls were observed on the Saskatchewan between the upper branches and Rocky Mountain House. The river valley is moderately uniform and contains one immense gap, being where it leaves the mountains through the Brazeau range. Between the Kootenay Plains and Rocky Mountain House four rivers and about twenty creeks enter the Saskatchewan.

## BRAZEAU RIVER.

The Brazeau River forms the secondary basin of the district. It rises at about 53° 00' N. Latitude and 117° 00' W. Longitude and flows in a general northeasterly direction. I was unable to make a complete reconnaissance of this stream and obtained no measurements lower than Brazeau Lake. On September 7 the discharge below the outlet stream from Brazeau Lake was 565 sec.-feet, 420 sec.-feet of which came from the lake. I followed the Brazeau from the Dowling ford at about Tp. 42, Rge. 20, W. 5th Mer., to the entarnet pass. The portion below Brazeau Lake I found very sluggish with a comparatively narrow channel and deep water. The course was winding and passed through a thickly wooded area. Above the lake the gradient rapidly changed becoming steep as it approached the upper branches. The stream was also visited at the mouth of the South Brazeau River, and found to contain a very wide channel, with gravel washes and rapid water. This location was very difficult to arrive at.

## MISTAYA RIVER. •

The Mistaya flows in a northeasterly direction from the Bow Pass and Peyto Lake to its mouth on the Saskatchewan River about one mile below the mouth of the North Branch. The gradient is very steep causing a total drop of at least 1400 feet. The stream is a very notable one on account of the lakes through which it passes and from a scenic viewpoint. It is wonderfully picturesque with its narrow valley formed of very high mountains, inlaid with glaciers, moraines and forests. The stream passes through four lakes, two of which are called the Waterfowl Lakes. A fifth lake also lies at the southeast foot of Pyramid Mountain and drains from the west into the Mistaya. These lakes and glaciers control very materially the distribution of the run-off of this stream. The lower part of the river channel passes through very deep narrow canyons which have been formed by the swift stream action on the sedimentary rock formation. Rapids in succession occur on these lower stretches. A few discharges were obtained at the cable station located near the stream mouth. These varied from 2166 sec.-feet on June 27 to 125 sec.-feet on October 9. The drainage area at the cable is about 135 square miles.

## SIFFLEUR RIVER.

The Siffleur flows in a northerly direction from the Pipestone pass to the Saskatchewan River at the Kootenay Plains. I visited only the lower portion of this stream and learned that about one mile above the mouth it entered a deep inverted cone-shaped rock canyon. Continuing about three-quarters of a mile up stream this formation changed to a narrow deep canyon which after one-quarter mile suddenly stopped, causing falls. The drop at these falls is about forty-five feet. Above this point the stream seemed to widen and remain nearer the valley level. Discharge measurements were made at the mouth of the lower canyon and varied from 1662 sec.-feet on June 27 to 135 sec.-feet on October 31. The drainage area at this point is about 229 square miles.

## WHITERABBIT CREEK.

This stream is about fifteen miles long, has a very straight channel and flows in a northeasterly direction entering the Saskatchewan about three miles below the Siffleur River mouth. The creek valley is notably narrow with steep rock slopes usually void of tree growth. A steep gradient also assists in causing a violent run-off. Large daily variations were noticed. Discharge measurements were made about one-half mile above the stream mouth. These varied from 222 sec.-feet on June 7 to 19 sec.-feet on May 18. The drainage area at the measurement point is about 213 square miles.

## CLINE RIVER.

The Cline flows in an easterly direction from the Cataract Pass to the Saskatchewan River at about Tp. 37, Rge. 18, W. 5th Mer. The upper course of this stream which has a large drop is called Cataract Creek and passes through a narrow valley bounded by high mountains and numerous small ice areas. Snow slides destroy much of the timber of this valley. Lower down the stream also retains a steep gradient and about four or five miles above its mouth the river passes into a very deep rock canyon. This continues for probably two miles after which the stream widens very much forming a large gravel wash near the mouth. Discharge measurements were obtained at the cable site about one-half mile above the mouth of the canyon. These varied from 1714 sec.-feet on July 9 to 161 sec.-feet on November 18. The drainage area at the cable is about 276 square miles.

## BIGHORN RIVER.

The Bighorn flows in a south and easterly direction from Tp. 40 Rge. 17, W. 5th Mer. to the Saskatchewan River at Sec. 16, Tp. 39, Rge. 16, W. 5th Mer. I was unable to reconnoitre the upper portion of this stream and am unable to report on same. Within four miles of the stream mouth, however, travelling upstream the channel changes from a very wide gravel wash to a narrow stream bed with high rock banks. I also believe a fall is located about six miles upstream from the mouth. Regular measurements were obtained at the cable station at Tp. 39, Rge. 16, W. 5th Mer. Discharges varied from 401 sec.-feet on July 11 to 27 sec.-feet on November 21. The drainage area is about 91 square miles.

## MARTIN CREEK.

This very small stream rises about four miles southwest of Nordegg flowing northeast through Nordegg to its mouth on Shunda Creek about one mile below the town. Gauge height and discharge records were obtained at SE. Sec. 27, Tp. 40, Rge. 15, W. 5th Mer. a point just above the intake of the Nordegg water works. Discharges varied from 15.2 sec.-feet on July 15 to 0.042 sec.-feet on November 5. The drainage area is about five square miles.

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## SHUNDA CREEK.

Shunda Creek, locally known as Mire Creek, rises in Tp. 41, Rge. 16, W. 5th Mer., and flows in a southeast and northeasterly direction to its junction with the Saskatchewan at about Tp. 40, Rge. 13, W. 5th Mer. The stream is well named as the basin contains much muskeg and a large tamarack swamp. The upper gradient is even and small but increases on the lower stretches of the stream. A gauging station was established near the mouth on June 3. and gauge heights were observed during the latter part of the season. Discharges at this point varied from 3426 sec.-feet on June 27 to 18.6 sec.-feet on November 6. The drainage area is about 120 square miles.

## RAM RIVER.

Ram River, locally known as Sheep River, enters the Saskatchewan from the south at about Tp. 39, Rge. 11, W. 5th Mer. I was unable to reconnoitre this stream more than a few miles above its mouth; however, I understand that at a point about twenty miles upstream the river divides about equally, one branch following a western course and the other continuing in a southwesterly direction. Discharge measurements were obtained about one mile up from the stream mouth. These varied from 33,579 sec.-feet on June 27 to 710 sec.-feet on September 25. The drainage area at this station is roughly 803 square miles.

## SOUTH BRAZEAU RIVER.

The South Brazeau rises in Sec. 21, Tp. 41, Rge. 19, W. 5th Mer., and flows in a northeasterly, east and northerly direction to its mouth on the Brazeau at about Tp. 44, Rge. 16, W. 5th Mer. The headwaters comprise three branches, Blackstone Creek from the west, George River from the southwest and Smith Creek from the south. These join the main stream at Tp. 42, Rge. 19, W. 5th Mer., which during the first mile of its course flows through a very narrow pass in the Brazeau Range, thus leaving the mountains. The stream below this point has a fairly steep gradient with a channel varying from the wide gravel wash to the very narrow deep style bounded by high rock banks. A gauging station was established at a point about one mile above the mouth of Chungo Creek and two measurements were obtained. The discharge on June 27 was 30,419 sec.-feet and on August 27, 331 sec.-feet. The drainage area is about 352 square miles.

## SOUTHESK RIVER.

The Southesk rises in Tp. 43, Rge. 22, W. 5th Mer., and flows southeast, east and northeast to its mouth on the Brazeau River at Tp. 43, Rge. 20, W. 5th Mer. I reconnoitred this stream for about five miles above its mouth and found a narrow channel with high rock banks and a steep stream gradient. This section of the stream valley was thickly wooded and partly covered with fallen burnt timber. A gauging station was established at the ford at about Sec. 6, Tp. 43, Rge. 20, W. 5th Mer., and two measurements were obtained. The discharges were 3,835 sec.-feet for June 27, and 462 sec.-feet for September 2. The drainage area at this point is 176 square miles.

## CHUNGO CREEK.

Chungo Creek rises in Tp. 42, Rge. 19, W. 5th Mer., and flows in a northeasterly direction through the Brazeau range to its mouth on the South Brazeau at about Tp. 43, Rge. 17, W. 5th Mer. A gauging station was established near the stream mouth and two measurements were obtained. These discharges were 9,351 sec.-feet for June 27, and 69 sec.-feet on August 26. The drainage area at this point is about seventy-seven square miles.

## BROWN CREEK.

Brown Creek, rises in Tp. 42, Rge. 19, W. 5th Mer., and flows in an easterly direction to its mouth on the South Brazeau River at Tp. 43, Rge. 18, W. 5th Mer. A gauging station was established at a point about five miles upstream from the mouth and two measurements were obtained. These discharges were 11,982 sec.-feet and 42 sec.-feet on June 27 and August 28, respectively. The drainage area at this station is about fifty-seven square miles.

*Recommendations.*

I beg to submit the following recommendations for the improvement of certain stations during 1916.

1. That an automatic gauge of the Stevens type be established on the North Saskatchewan River at Wilson's ranch at about Tp. 40, Rge. 13, W. 5th Mer.

2. That cables be erected on the following streams:—

- (a) Ram River near mouth of stream at gauging station.
- (b) South Brazeau River above mouth of Chungo Creek at gauging station.
- (c) Brazeau River near Dowling's Ford.
- (d) Southesk River near Forestry Ford at gauging station.

*General.*

Whenever possible during the season's work water storage sites were investigated, and rough surveys made. The following sites were reported on: Brazeau Lake, Glacier Lake, Peyto Lake, and the Waterfowl Lakes. Of these, Glacier Lake is probably of most importance.

Miscellaneous measurements were made whenever considered of value.

All discharge measurements of June 27 in connection with the maximum discharges of June are the results of slope measurements.

A tabulated summary of the season's work is included as follows:—

Regular measurements.....	80
Miscellaneous measurements.....	47
Miles travelled via rail.....	1715
Miles travelled via trail.....	1489
Gauging stations established.....	11
Cables erected.....	5
Surveys made.....	7
Irrigation inspections.....	1

**APPENDIX No. 2**

REPORT OF P. H. DANIELLS, B.Sc., DISTRICT HYDROMETRIC ENGINEER,  
FOR THE YEAR 1915.

**REPORT ON THE PEACE RIVER DISTRICT.**

The Peace River district, organized during the past season, includes streams in both the Peace and Lesser Slave River drainage basins.

Previous to 1915 no work was done in this district except on the Lesser Slave River near Sawridge, where a few miscellaneous measurements were made in 1914. However, during the past season this territory was made a regular "Hydrometric district" and a few gauging stations were established in each drainage basin. On account of the poor methods of transportation in the Peace River country it was not feasible to cover the whole district, and measurements at the stations established could only be made at rather long intervals.

**THE PEACE RIVER.**

The Peace is formed by the confluence of the Parsnip and Finlay Rivers both of which rise in and drain a large district lying along the eastern slope of the Rocky Mountains in northern British Columbia.

The important tributaries of the Peace River are the Pine, Smoky, Wabiskaw and Red Rivers.

There are several smaller streams which discharge their waters into the Peace, but as all of them except the North Heart flow through a very sparsely settled country, they are as yet of little interest to this office.

The Pine River rises in the mountains of British Columbia and enters the Peace on the south side about thirty miles west of the Alberta boundary, it is the largest tributary west of the Smoky River.

The Smoky and North Heart Rivers will be taken up separately in this report.

The Wabiskaw and Red Rivers both rise on the height of land west of the Athabaska River and drain a large extent of low country lying between the Athabaska and Peace Rivers and north of the Lesser Slave Lake. No measurements were made on either of these rivers during the past season, but it is probable that a few miscellaneous measurements will be made during the coming winter.

Except for the last two mentioned streams the branches of Peace River all obtain the greater portion of their supply from the mountains, and the stage of water is governed to a great extent by the winter precipitation, therefore floods in the early spring are not usual. However, during July the high temperatures and warm rains in the mountains cause the snow-covered area of the drainage basin to discharge large quantities of water, and it is at this time that the greatest floods occur. In 1915 there was no exceptional flood on the Peace River. The maximum stage was reached on July 14 and was caused by a warm rain in the upper drainage basin. The effect was more noticeable on the Smoky than on the Peace River.

For the purpose of description the Peace may very well be divided into three sections:

1. From its head to the mouth of the Smoky.
2. From the mouth of the Smoky to Fort Vermilion.
3. From Fort Vermilion to the Great Slave River.

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The first section is about 300 miles long. Over this distance the river flows through a great plateau in which it has excavated to a depth of from 600 to 900 feet. The banks are steep and the valley narrow but gradually widening from the line between British Columbia and Alberta, where the river passes through a steep rocky canyon, known as the Peace Canyon, to Peace River Crossing where the valley is about three miles wide.

The country back from the river is composed of alternate patches of thinly wooded and prairie land with a few muskegs. A large percentage of the land is well suited for agricultural purposes. The district lying between the Peace and Wapiti Rivers, known as the Grande Prairie country, contains the largest percentage of open land. Owing to this fact and on account of the excellence of the soil and the lines of progress of the railways, this portion of the country is being the most rapidly settled.

The second section of the river, between the mouth of the Smoky and Fort Vermilion, is about two hundred and seventy miles long. Throughout this distance the river pursues a winding though northerly course nearly to Fort Vermilion and then turns eastward. The banks are about seven hundred feet high at the beginning of the section and gradually decrease in height until at Fort Vermilion the river is very little lower than the level of the surrounding country. Over this section the land adjacent to the river is nearly all wooded with aspen, poplar and frequent patches of spruce; it also contains numerous muskegs. Back a few miles from the river on both sides there are portions of open land suitable for immediate settlement and as the stream approaches Fort Vermilion the prairie extends to the river banks. Close to Fort Vermilion, especially on the south side of the river, there are large patches of prairie land. At this point there has been a settlement for several years and all ordinary grains and vegetables have been grown successfully.

The third section of the river, between Fort Vermilion and the Great Slave River, is about two hundred miles long. The stream flows in a northeasterly direction for about one hundred and fifty miles and then takes a general easterly course until it is joined by the overflow from Lake Athabaska forming the Great Slave River. The country through which the river flows in this section is not well known. I had no opportunity of getting over this portion during the past summer, and was unable to learn much about the surrounding country as all of the travelling through here has been done on the river.

The Peace is the largest and longest branch of the Great Northern Waterways system. It is navigable during high water from Hudson's Hope on the line between Alberta and British Columbia to the Great Slave River, a distance of nearly eight hundred miles, with only one interruption, the Vermilion Falls. At this point rapids and falls in the river necessitate a portage of about seven miles. During the lower stages there are two or three places between Dunvegan and Hudson's Hope where boats drawing much over two feet of water cannot pass.

There is an opportunity of extensive power development at two points on the Peace. The first is near Hudson's Hope where the river passes through a narrow rocky canyon, which is about twelve miles in length. Over this distance the river falls about sixty feet. The second point is at Vermilion Falls, about fifty miles downstream from Fort Vermilion. It has been estimated that 150,000 horse power could be developed here at the low water period, but our measurements made at Fort Vermilion show that this estimate is high.

The following facts about the Vermilion Falls and rapids were given me by Mr. Bisset, of the Water Power Branch, who made a survey of this site in October, 1915:—

The difference in elevation of the river between the head of the rapids and the foot of the falls is twenty-six feet in low water and gradually decreases as the water rises. About fourteen feet of this distance is taken up in the falls alone, the balance in the rapids above. On account of the low left bank of the river it would not be practicable to increase the head to much over thirty feet. The bed and banks of the river at this point are composed of solid limestone.

These are the only two points on the river where extensive power development is possible, but there is another larger fall in the river after it is joined by the overflow of Lake Athabaska and known as the Great Slave River. I made enquiries about this site and sent in a report in August.

During the past summer two gauging stations were established on the Peace River, one at Peace River Crossing in the northwest quarter of Section 29, Township 83, Range 21, West of the 5th Meridian, and one at Fort Vermilion in Section 14, Township 108, Range 13, West of the 5th Meridian.

The expense of constructing a cable station at either of these points would be excessive. Measurements were made at both points from some type of boat. At Peace River Crossing it was possible to use the ferry boat most of the time. As it is impossible to make gaugings from any type of boat in high water, slope measurements were made at this time.

## THE SMOKY RIVER.

The Smoky River rises on the eastern slope of the Rocky mountains in Township 56, Range 8, West of the 6th Meridian, and flows in a general northerly direction to its mouth, about two miles south of Peace River Crossing. After leaving the mountains the river flows through a fairly low country, mostly wooded and containing numerous muskegs, until it is joined by the Wapiti River. From this point on, the general class of country drained by the river improves. The stream passes through high steep banks and is fairly swift throughout its length. Below



the mouth of the Little Smoky River, the river falls quite rapidly and contains a number of small rapids, the largest of which is known as the Twenty-five Mile rapids and is about twenty-five miles from the mouth. On account of the numerous rapids and the quantities of large boulders lying in the river bed it is navigable only in the higher stages and then only for boats of quite light draft.

The largest tributaries of the Smoky are the Wapiti and Little Smoky Rivers. The Wapiti River rises in Township 65, Range 13, West of the 6th Meridian, and flows eastward to its mouth. It rises in the mountains and is fairly swift throughout its length. This river forms the southern boundary of the Grande Prairie country and on this account will probably be one of the first streams in this country to be developed. I intended to establish a regular gauging station near the mouth of this stream during the past summer and ordered the necessary supplies for it, but on account of the irregularity and uncertainty of transportation decided that it would be advisable to wait until next season, when it will be possible to reach Grande Prairie by railroad. In this case it will be quite easy to establish and maintain a station near Grande Prairie city.

The Little Smoky River rises in Township 56, Range 3, West of the 6th Meridian, and drains a large low country between the Athabaska and Smoky rivers. It enters the Smoky River at the east side about sixty-five miles upstream from the Peace River. One measurement was made near the mouth during the past season.

The gauging station on the Smoky River was established on June 4 at Prudent's Crossing in SW.  $\frac{1}{4}$  Section 10, Township 78, Range 24, West of the 5th Meridian. The discharge measurements were made from the ferry boat. In this case also it was found impossible to work from the boat during high water stages and slope measurements were made. A cable station could be established here at a comparatively small cost, but as the Edmonton, Dunvegan and British Columbia railway are now building a bridge about two miles upstream from the station it will probably be unnecessary.

#### NORTH HEART RIVER.

The North Heart River rises in Township 80, Range 19, West of the 5th Meridian, and flows in a northeasterly course to its mouth at Peace River Crossing. It flows through low banks and on easy gradients to within twelve miles of its mouth where it begins to fall quite rapidly and has excavated a deep, fairly narrow valley.

A gauging station was established on this stream about one-half mile from its mouth on June 2, 1915. The station is a poor one on account of its nearness to the Peace River, the stage being affected by high water in the Peace. Although this was known when the station was established it was impossible to obtain an observer at a point away from the influence of the Peace River.

#### *Miscellaneous measurements.*

Miscellaneous measurements were made of the following streams in the Peace River district during 1915:—

Little Smoky River, near mouth; Cadotte River, near mouth; Whitemud River, near mouth; Battle River, near mouth; Buffalo River, near mouth.

In concluding this part of my report I wish to recommend that a motor boat be purchased for use in this district. While a discharge measurement made from any type of boat is not entirely satisfactory, much better work can be done from a motor boat for several reasons. First, it can be used in fairly swift water where it is practically impossible to use a hand-propelled boat. Second, owing to its greater weight it can be used in a strong wind, when it is impossible to keep a canoe in a constant position. Third, a stay line can be used with a motor boat. Fourth, greater speed can be obtained.

The motor boat as a means of transportation would soon pay for itself. It could be used for any work on the Peace River between Hudson's Hope and Fort Smith, and if the right type of boat was secured it could be used upon the Smoky River between Peace River Crossing and the mouth of the Wapiti River.

I would suggest, for this purpose a flat bottomed tunnel boat about twenty-four feet long and with a four and one-half foot beam, to draw not more than ten inches of water and to be capable of developing a speed of about six miles per hour against the Peace River current. This I think could be done with a 16-20 h.p. motor. This type of boat could be obtained for about \$650.00 and could be used during the entire open water season, except for about two weeks in July during the flood stages. At this time it is impossible to use any kind of boat for making gaugings on account of the large quantities of driftwood running.

I found during the past summer that it is cheaper to travel in a small motor boat, also that on account of the steamboats operating on the river not running on a regular schedule, it is impossible to make gaugings at such points as Fort Vermilion with any regularity. During the past season there were only four steamboat trips made between Peace River Crossing and Fort Vermilion, and only one between Peace River Crossing and Hudson's Hope.

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## LESSER SLAVE RIVER DRAINAGE BASIN.

The Lesser Slave River drainage basin is bounded on the north by the Wakiskaw and Red Rivers, on the west by the Smoky and on the south by the Athabaska River. The drainage from the country included in this area passes into the Lesser Slave Lake, a large, shallow lake with low marshy shores. The land surrounding the lake and, in fact, all of the country in the drainage basin, except in the extreme southern end, is low, mostly wooded with aspen and spruce and contains numerous muskegs.

The South Heart and Swan Rivers are the two most important ones emptying into the lake; some of the minor streams are the Driftpile and Assineau Rivers and Suiker Creek, but they are quite small, discharging only from two to ten second-feet during the low water period.

The nature of the country in this drainage basin is such as to make most of the streams practically useless from a standpoint of power development or for irrigation purposes.

Only two regular gauging stations were established in this district, one on the Swan River near Kinuso and one on the Lesser Slave River at Sawridge.

## SWAN RIVER.

The Swan River rises in the mountains in the extreme southern end of the drainage basin and flows northward. After leaving the foothills it is joined by the Inverness River and from this point passes through a low level country to its mouth.

## LESSER SLAVE RIVER.

The Lesser Slave River obtains nearly all of its supply from the Lesser Slave Lake and discharges into the Athabaska River. At its head the gradient of the river is very slight, the course winding and the banks quite low. As it approaches the Athabaska the banks become higher and the fall more rapid. About sixteen miles from its mouth there is a rapid, and at this point an opportunity for a considerable power development exists.

The stage of the Lesser Slave River is regulated by the water level of the lakes, and floods do not occur. The flow is fairly constant, there being less difference between the summer and winter discharge than on the ordinary Alberta stream.

Miscellaneous measurements of the following streams in this drainage basin were made:

East Prairie River, near High Prairie; West Prairie River, near High Prairie; South Heart River, near High Prairie.

## APPENDIX No. 3

## THE USE OF BOATS FOR MAKING STREAM MEASUREMENTS,

By P. H. DANIELLS, B.Sc.,

DISTRICT HYDROMETRIC ENGINEER.

This paper will be limited to a description of the several types of boat measurements made on the Peace River district during the past summer.

These types can be classed under the three following heads:

1. Measurements made from ferry boats.
2. Measurements made with boat and anchor.
3. Measurements made with boat and cable.

Although a ganging made from any sort of boat is not entirely satisfactory, the best results are probably obtained with a boat and cable, but owing to the great width of the rivers in this district it was impossible to employ this method very often, and I will therefore take up more particularly the description of the first two methods.

## FERRY BOATS.

Two types of ferry boats were used. First the ordinary scow ferry. This design of ferry boat is familiar to everyone so a description of it is not necessary. This boat is not very well adapted to our work because of the difficulty of keeping it in a constant position and because it cannot be used in swift water as the increased pressure on the cable, when the boat is turned squarely against the current, is too great. Also the current-meter must be suspended from one end of the ferry on account of the velocity immediately in front or at back of the boat being affected by the submerged portion, and as the boat always swings from side to side to a small extent, this will cause a small error in the recorded velocities.



The second type is the pontoon ferry and as a boat for stream measurement work this design could hardly be improved upon. This boat, as shown in Fig. 1, consists of a platform bridged across two sharp-nosed scows. The scows are about ten feet wide and are placed twelve feet apart. The platform is so far forward that the stern end of it is quite close to the centre of the ferry, and if the current meter is suspended at the point (A), any error in the recorded velocities caused by the swinging motion of the boat is eliminated. The velocity of the water under the centre of the bridge is not disturbed by the submerged portion of the scows. This type of boat can be used in any stage of water, the pressure on the cable being much less when the boat is stationary than when it is in motion. The total length of the ferry is about thirty feet, and it is, therefore, possible to use a proper stay line.

#### *Boat and Anchor.*

This method was used with two types of boats, a motor boat and a canoe. The former is the most satisfactory for several reasons. It can be used in faster water and if properly equipped a stay line can be used. Owing to its greater weight a motor boat can be held stationary in a fairly hard wind while a canoe, even though anchored from both bow and stern, will shift slightly from side to side in a gentle wind and if the wind is strong across the river or upstream it is impossible to use a canoe with any degree of accuracy. The greatest disadvantages of a canoe are that a stay line cannot be used and that it does not allow the operator to move around freely. In my work it was used only when it was impossible to employ any other method. The meter was suspended about four feet in front of the boat and on account of no stay line being used velocities were read at a depth of four feet. The boat was anchored at both bow and stern. This method is very slow, it is necessary to lift both anchors entirely out of water before any progress can be made with the boat and in a fairly swift current it takes several minutes to get back to the line of measurement. It is quite difficult to judge the distance between soundings with any accuracy especially if the interval of paddling is very long, and often it is necessary to make two or more attempts before the proper location is reached.

With the motor boat the meter was suspended from the stern and about four feet to one side of the boat. The boat was anchored from the bow only. By use of the engine it was possible to move quickly and without lifting the anchor out of the water and soundings could be made at fairly regular intervals with very little difficulty. The engine was running at all times, but with the clutch thrown out after the boat was anchored.

With any type of boat it is difficult to judge the distance between soundings, especially near the centre of the stream. I tried to overcome this by using floats anchored at regular intervals across the stream. This method worked very well in shallow and sluggish water but in deep fairly swift water it took so long to arrange the float and anchor it in the proper location that I decided it was faster and easier to take the soundings at closer intervals and make sure of the distances in that way.

In all classes of boat measurements, except those made with a boat and cable, it is necessary to measure the distances of soundings by means of triangulation. In this case a sextant was used and angles were read from the boat. A much more satisfactory way would be to use a transit and measure the angles from the shore, but this would require an extra man.

Two stakes were placed on line with the measuring section so that the boat could be kept on line. From the stake nearest the river's edge an angle of ninety degrees was turned and a base line carefully measured. Stakes were placed along the base line at such places as would make the angles read neither too large nor too small. For instance, on the Peace River at Fort Vermilion, where the river is about eighteen hundred feet wide, a fifteen hundred foot base line was used. Stakes were put in at two hundred, five hundred, one thousand and fifteen hundred feet from the line of measurement and the angles read from the first stakes for distances up to about three hundred feet, then from the second stake, etc. Even distances were used to simplify the computations.

In the case of a ferry boat measurement, such as on the Peace River at Peace River Crossing, a slightly different method is necessary. At this point the river is about fifteen hundred feet wide in high water and, owing to this fact and on account of the swiftness of the current, the ferry boat does not pursue a straight course across the river but goes down stream for a considerable distance as it approaches the middle of the river and the slack is pulled out of the cable. Even by moving from end to end of the boat it was impossible to keep on the measuring line, therefore it was necessary to lay out two separate lines, one about fifty feet from the other. The full line, Fig. 2, was used for measuring angles between zero and five hundred and between one thousand and fifteen hundred. For the intervening distance the dotted line was used.

#### *Soundings.*

A little difficulty was experienced in getting accurate soundings. This was caused by trying to use the ordinary methods. At Peace River Crossing I was able to use a stay line and a weight of about two hundred and twenty-five pounds, but under the worst conditions encountered, a depth of twenty-eight feet and a velocity of over ten feet per sec., it was impossible to know whether the weight was on the bottom of the river or was being supported by the stay line. I do not think accurate results can be obtained by the use of a stay line under such conditions. I found that by using a fifteen pound weight on a very light line, about one-eighth of an inch in

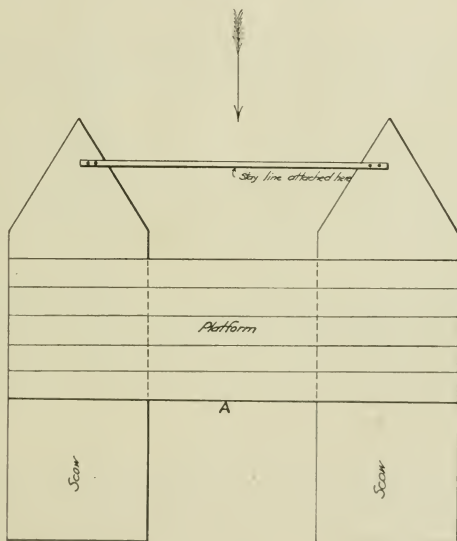


FIG. I

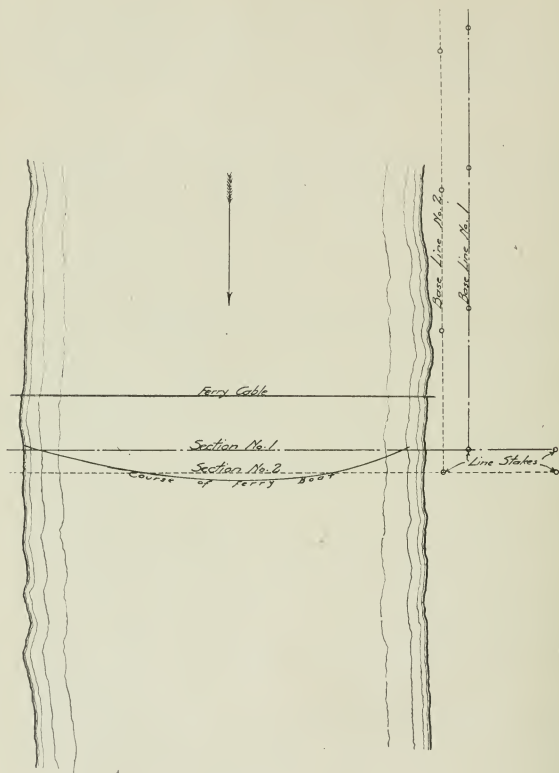


FIG. 2

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diameter, and throwing it upstream as far as possible, the depth could be accurately measured just as the weight was passing the boat in the current. In the case mentioned it was also impossible to tell when the meter was at the proper depth for readings, and readings were taken at a depth of three feet, and a constant, which had been determined from several vertical velocity measurements made in the same stream but in slower water, applied.

## APPENDIX No. 4

### FLOODS IN ALBERTA AND SASKATCHEWAN IN JUNE AND JULY, 1915.

By G. H. WHYTE, DIVISIONAL HYDROMETRIC ENGINEER.

#### *General Introduction.*

In 1915 the eastern slopes of the Rocky Mountains between the Crownsnest and Yellowhead Passes in Alberta and the adjoining prairie in that province and portions of its eastern neighbour, Saskatchewan, were subject to unusual precipitation which during June was exceptionally heavy, culminating about June 25. This heavy precipitation caused the run-off for all streams in this area to be much above the average and in June and July caused floods on many of the streams.

High water on the streams of Alberta and Saskatchewan is usual at least once a year and is of two kinds, depending on the type of catchment area; the first kind, when the ice breaks up and the run-off of the winter snows of the prairies takes place, usually in March; and the second, caused by the run-off of the snows of the mountains in June or July. It is only occasionally that either of these periods of high water reaches the magnitude of a flood. Every few years on some of the minor streams and at longer intervals on the main arteries, floods of some magnitude occur which, while they may be augmented by the run-off of snow water, are caused by exceptionally heavy rainfalls in a short period of time over an already well saturated ground surface.

#### *Scope of this Report.*

The object of this report is to present the principal and important facts pertaining to the discharge of streams during the flood of June-July, 1915. It is hoped that the data herewith given are complete and extensive enough for all ordinary purposes, but it is realized that many facts which may be of service are not given and with the time available it would be impossible to present these without also presenting much which would be of little value. A large quantity of data has been gathered at various points which is available on request. It is well to state that much was not obtained owing to the vast territory to be covered by a small staff of engineers who primarily collected only such data as was required for the proper compilation of the hydro-metric work.

#### *Accuracy of Data.*

The data herewith given are as reliable as possible but may contain some inaccuracies owing to the impossibility of obtaining full details at some points where none of our engineers were during the flood and where the gauges were destroyed. The computations are, with few exceptions, well within the required degree of accuracy as discharge curves for both the period before and after the flood were obtained in all cases. A few inconsistencies may appear as attempts to eliminate them have not been made where sufficient data was not available.

#### *Acknowledgments.*

The precipitation data herewith given are from the records of the Meteorological Service of Canada. A few gauge heights and other records were obtained from various municipal and other authorities as well as from railway and private corporations. These records were of special value in individual station studies, and acknowledgments are due all who supplied such data and for such assistance as was rendered to our engineers during the progress of the flood.

#### *Division of Work.*

The work during the flood was under the direct supervision of the Chief Hydrometric Engineer, Mr. P. M. Sauder, who was assisted in the office by Mr. W. K. Broughton. The streams on the Crownsnest Pass were under the charge of Mr. W. R. McCaffrey and those near Lethbridge under Mr. J. E. Degnan. The headwaters of the Bow River were under the charge of Mr. H. C. Ritchie, the Bow River at Calgary under the charge of Mr. G. H. Whyte, the

Elbow River at Calgary under the charge of Mr. G. R. Elliott, the tributaries south of Calgary under the charge of Mr. H. B. R. Thompson, and the Bow River at Bassano under the charge of Mr. R. J. McGuinness. The Red Deer River at Red Deer was under the charge of Mr. H. M. Nelson. The Athabaska River and tributaries were under the charge of Mr. J. M. Paul. The North Saskatchewan River was under the charge of Mr. I. R. Strome at Edmonton and Mr. G. H. Whyte at Prince Albert. Mr. Snelson had charge of the work on the South Saskatchewan River at Medicine Hat and Mr. F. K. Beach at Saskatoon.

The office ratings were made by W. R. McCaffrey, R. J. McGuinness, H. C. Ritchie, J. M. Paul, I. R. Strome and F. K. Beach, hydrometric engineers, under the supervision of G. H. Whyte, Divisional Hydrometric Engineer.

The computations were made by W. H. Storey, R. J. McGuinness, W. R. McCaffrey, H. C. Ritchie, J. M. Paul, I. R. Strome and F. K. Beach, hydrometric engineers, under the supervision of N. M. Sutherland and G. H. Whyte, Divisional Hydrometric Engineers.

#### *Temperature and Precipitation.*

The following meteorological data are attached as these factors play an important part in run-off and floods.

Table A 1 shows the mean temperature, total precipitation and highest precipitation on a single day as well as comparisons with the average at all stations on the eastern slope of the Rocky Mountains between the Crowsnest and Yellowhead Passes during June.

Table A 2 shows similar records for each month at a number of stations from October, 1914, to July, 1915.

Table A 3 gives monthly precipitations for the last ten years at various points.

Plate A 4 shows isohyets lines for June also gauging stations and headwaters of the drainage basins affected by the flood. It should be noted that the isohyets lines shown are only approximate and may be in error at various points.

It has been stated that on the headwaters of the North Saskatchewan River there was more snow than usual about June 25, while the opposite seems to be true about the headwaters of the Bow River. However, reliable data with respect to this factor are not available.

#### *General Causes of the Flood of June-July, 1915.*

The causes of the large run-off over a short period in June, 1915, can be classed under two general heads, namely:

- (1) The heavy precipitation of that period.
- (2) The conditions affecting the run-off.

Each of these two heads requires some discussion and while somewhat different are also closely connected. That is, unless conditions were favourable for a speedy run-off of much of the rainfall, no such flood could have occurred. From the meteorological records it is seen that there were unusual amounts of rain in both May and June, 1915, and the rains of June 24 to 27 were of exceptional density at some points, therefore, no further discussion of the first head is necessary.

Under the second head, "The conditions affecting run-off", there are several sub-heads, namely:

- a. Topography.
- b. Geological structure.
- c. Evaporation.
- d. Vegetation.
- e. Ground water.

The first of these, (a) "Topography," has, of course, a marked effect in changing rainfall to run-off. Steep slopes, as found in mountain areas, run off a greater percentage of the rainfall than gentle slopes, such as found in the foothills, and gentle slopes run off more than lands, such as prairies, which often have very slight slopes. Each drainage basin has been described in more or less detail so that it is unnecessary to state that all types of topography are met with in each of the basins mentioned in this report.

The (b) "Geological structure" of an area no doubt has some part in determining its run-off, but authorities seem to differ as to its importance. The areas under consideration in this report are, as far as run-off is affected, fairly similar in their geological structure and therefore need not be extensively commented upon. The upper beds of the mountain regions are for the most part of limestone series, although others are of quartzite, which in most cases has little or no soil cover. The foothills, on the other hand, are principally of sandstone and shale series which in general has an abundant soil cover. Full details of the geology of this whole area may be found in many reports on the geological features of the Rocky Mountains, or of various areas published by the Geological Survey of Canada.

The (c) "Evaporation" over an area is one of the most important points to be considered in a study of the run-off of precipitation. It depends on a great many other factors and is here taken to include direct evaporation into the air and indirect evaporation or absorption by plant growth. The amount of water evaporated into the air of course depends on the temperature, velocity of winds and atmospheric pressure. Over the area covered by this report it is known that the temperature during both May and June of 1915 was below normal, and in June

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up to the date of the heavy rains there were few warm days. Therefore it is assumed that from the point of temperature the evaporation would be low. The velocity of winds over the area from the records at Calgary and Edmonton was little above 1914 and probably about normal. Atmospheric pressure at Banff, Calgary and Edmonton was above that of the four previous years, and the effects that this condition would produce would favour low evaporation. The humidity was also greater in 1915 than in the two previous years. The absorption by plant growth would apparently not be as great in June as usual, as it was stated at that time that crops were backward, owing to the cool weather and great amount of rain. If the conditions were such on the prairies, where the mean temperature was about five degrees above the foothills and mountain section and the precipitation from two to eight inches less, it can be assumed that they were at least similar in the foothills and mountains.

From the foregoing it can be readily seen that the evaporation for May and June can be assumed as being below the average for those months, thus allowing more than the usual amount of rainfall to become ground water and run-off.

The (d) "Vegetation" of an area has a marked effect on the run-off and evaporation. A cover of trees with their matted roots forms an effective pondage for quantities of ground water and retards the run-off to a noticeable extent. They also protect the surface of the ground from the direct rays of the sun, reducing to some slight extent direct evaporation from the soil. The presence of vegetation also has the effect of increasing evaporation by absorption into plant life and by exposure to the air of large quantities of moisture contained in leaves, much of which is evaporated.

It is seen, therefore, that forests and their plant life adjuncts have a retarding rather than an accelerating effect in converting precipitation into run-off. The foothills and mountains of Alberta are not well covered with tree growth owing to the repeated fires in past years. Better protection from fires is aiding the gradual development of forest cover, and as this cover extends, the effects of heavy rains should not be felt as quickly nor as markedly.

A proportion of all precipitation finds its way into the ground and forms that little known or understood part of hydrography called (e) "Ground water." The earth's surface is penetrated to great depths by ground waters which are constantly in motion. Towards the surface these waters are affected in their motion by various conditions, such as changes in atmospheric pressure and temperature. In addition to the above, precipitation, which is the source of ground water, plays an important part in such motion. The motions of ground or sub-surface water, like surface waters, are vertical and horizontal, and the vertical motion is greatly affected by rainfall. The horizontal or sub-surface flow of ground water is a fairly constant factor, that is, the channels remain of a more or less constant size, and the only increase in flow is caused by increase of head. The upper soils of the earth are much more open than the lower and especially is this true where there is a good growth of plant life and these parts are subject to great changes in position of the ground water. When heavy rains take place the upper soils absorb great quantities of water which gradually filter through the lower strata. If the rains are continuous it can be seen that sooner or later the surface stratum absorbs all the water it possibly can, and as the lower strata cannot carry away the rain as fast as it falls most of it will have to run off on the surface.

*Division of Report.*

This report has been divided into seven parts corresponding to the drainage basins affected. These parts are as follows:

- Part 1.—General Introduction.
- Part 2.—South Saskatchewan River Drainage Basin.
- Part 3.—Oldman River Drainage Basin.
- Part 4.—Bow River Drainage Basin.
- Part 5.—Red River Drainage Basin.
- Part 6.—North Saskatchewan River Drainage Basin.
- Part 7.—Athabaska River Drainage Basin.

TEMPERATURE AND PRECIPITATION at a number of METEOROLOGICAL STATIONS IN ALBERTA,  
for June 1915.

TABLE A.1

DRAINAGE BASIN.	STATION.	Yrs. Observations.	Temperature.			Precipitation.			
			Mean.	Difference from Average.	Mean daily range.	Amount.	Difference from Average.	Heaviest fall in Month.	Date of heaviest fall.
Oldman River.....	Coleman.....					3.16		0.60	25
	Lundbreck.....	2	48.5	-3.1	21.9	6.83		1.39	.....
	Cowley.....					6.80		1.20	25
	Maycroft.....					6.32		1.65	25
	Pincher Creek.....	16	51.7	-3.1	18.4	7.68	+4.63	1.59	.....
	Macleod.....	19	54.9	-2.5	25.9	3.24	+0.61	0.98	.....
Little Bow River.....	Lyndon.....					11.78		3.00	26
	Claresholme.....					4.88		1.20	25
	Nanton.....					9.26		2.35	25
Bow River.....	Banff.....	20	50.2	-1.1	24.1	6.05	+2.86	1.97	25
	Lake Louise.....	1	46.8		24.7	5.70		2.17	.....
	Calgary.....	31	54.1	-1.1	23.0	4.02	+0.75	0.66	.....
	Okotoks.....	3	51.2		17.7	5.59		1.08	.....
	Pekisko.....	5	47.2		26.4	10.02		1.74	.....
	Jumpingpound.....					8.94		2.22	2
Red Deer River.....	Lineham.....					9.19			.....
	Hillsdown.....	11	52.7	-3.7	19.7	5.25	+0.85	0.77	.....
	Red Deer.....	15	51.6	-2.3	21.4	4.81	+0.18	2.11	.....
	Lacombe.....	8	52.6		23.0	8.28		2.20	.....
	Springdale.....	3	50.9		22.9	8.00		1.37	.....
N. Saskatchewan River.....	Bismark.....					7.89		1.59	2
	Ponoka.....					5.12		1.95	26
	Edmonton.....	33	54.2	-3.1	21.1	5.46	+2.05	1.13	.....
Athabaska River.....	Mountain Park.....	1	45.2		21.8	12.26		3.35	.....
	Wabasca.....	1	55.9		24.5	2.08		0.93	.....
	Athabaska.....	12	52.6	-2.9	25.9	2.46	-1.10	1.06	.....



## SESSIONAL PAPER No. 25c

## MONTHLY MEAN TEMPERATURE AND MEAN DIFFERENCE FROM AVERAGE FOR YEAR AT SEVERAL ALBERTA METEOROLOGICAL STATIONS from October, 1914 to September, 1915.

TABLE A.2

STATION.	1914.			1915.										Monthly Mean.	Diff. from Ave'g.
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July.	Aug.	Sept.			
Lundbreck. ....	38.8	30.1	10.9	.....	24.0	30.1	44.1	44.0	48.5	53.0	60.0	45.0	38.95	.....	
Pincher Creek. ....	42.0	33.9	15.0	24.2	26.8	33.5	47.1	47.8	51.7	58.0	64.0	47.0	40.91	+1.75	
Macleod. ....	42.8	34.7	9.6	19.4	.....	31.5	49.6	51.1	54.9	61.0	67.0	49.0	42.78	—0.70	
Calgary. ....	44.6	32.0	13.0	19.8	24.4	33.0	49.3	49.7	54.1	59.0	65.0	49.0	41.07	+3.40	
Banff. ....	41.4	28.7	9.7	16.0	23.5	32.2	44.4	46.4	50.2	56.0	60.0	46.0	37.90	+2.16	
Lake Louise. ....	.....	.....	.....	.....	14.5	25.3	38.2	44.2	46.8	51.0	56.0	41.0	39.43	.....	
Red Deer. ....	40.7	25.9	8.1	10.4	20.0	27.0	44.9	48.5	51.6	55.0	63.0	46.0	36.76	+0.52	
Mountain Park. ....	.....	.....	.....	.....	.....	27.2	32.4	41.0	45.2	.....	.....	36.0	36.36	.....	
Edmonton. ....	43.3	29.8	9.0	10.8	15.3	30.5	48.8	52.2	54.2	59.0	65.0	48.0	38.83	+1.48	

## MONTHLY PRECIPITATION AND DIFFERENCE FROM PERIOD AVERAGE AT SEVERAL ALBERTA METEOROLOGICAL STATIONS from October, 1914 to September, 1915.

[STATION.	1914.			1915.										Total for Period.	Diff. from Ave'g.
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.			
Lundbreck.....	4.90	2.00	0.55	.....	0.73	1.43	0.87	5.12	6.83	4.54	1.32	1.50	29.79	.....	
Pincher Creek.....	3.79	1.30	0.70	1.03	1.73	1.24	1.80	3.37	7.68	4.01	1.24	2.31	30.20	+ 10.76	
Macleod.....	2.46	1.66	2.00	1.05	.....	1.14	0.12	2.32	3.24	4.40	2.26	0.61	21.26	+ 3.69	
Calgary.....	1.82	2.73	0.75	0.40	0.23	0.07	0.46	3.13	4.02	3.98	0.68	2.33	20.60	+1.35	
Banff.....	1.69	2.60	0.28	1.06	0.75	0.30	1.00	2.34	6.05	3.96	1.47	2.69	24.19	+ 3.07	
Lake Louise.....	.....	.....	.....	.....	0.88	0.43	1.66	1.48	5.70	4.56	1.29	2.28	18.28	.....	
Red Deer.....	1.44	1.53	1.50	0.95	0.00	0.01	0.48	4.30	4.81	3.36	0.69	2.40	21.47	—1.08	
Mountain Park.....	.....	.....	.....	.....	.....	2.13	2.68	4.55	12.26	.....	.....	2.54	24.16	.....	
Edmonton.....	1.07	0.85	1.49	1.04	0.02	0.10	0.92	1.30	5.46	4.24	3.24	0.97	20.70	+ 2.50	

## ANNUAL PRECIPITATION FOR SEVERAL METEOROLOGICAL STATIONS IN ALBERTA for years 1906 to 1915.

TABLE A.3

Station.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Mean for period.
Pincher Creek.....	.....	.....	.....	20.22	.....	.....	.....	.....	.....	26.39a	24.78
Macleod.....	.....	12.37	18.13	23.39	.....	20.54	12.73	10.58	20.50	16.31a	16.81
Calgary.....	16.21	14.96	18.25	16.03	12.03	19.37	21.40	17.04	17.71	18.09	17.11
Banff.....	14.58	23.56	21.09	10.19	16.32	19.16	20.51	17.36	17.69	21.87a	18.23
Red Deer (Hillside).....	.....	17.51	.....	17.26	21.25	23.40	20.37	.....	26.73	19.44a	20.86
Edmonton.....	.....	16.62	.....	17.88	14.03	20.06	20.20	19.55	25.18	18.25	18.55

a December 1915 reports not available.

## SOUTH SASKATCHEWAN RIVER DRAINAGE BASIN.

*General Description.*

This stream is formed by the junction of the Oldman and Bow Rivers at a point known as the Grand Forks in Alberta. It flows in a northeasterly direction through the eastern part of Alberta and almost across Saskatchewan where it joins the North Saskatchewan River forming the Saskatchewan River proper.

The river is joined by the Sevenpersons River near Medicine Hat, the Red Deer River just after it crosses into Saskatchewan and farther down by Swiftcurrent Creek, the Red Deer being the only tributary with much of a flow.

The whole of the drainage area of this river is prairie and from it there was little run-off in June to augment the flood discharges of the Oldman, Bow and Red Deer Rivers. It is therefore not necessary in this report to go into the causes of the flood, precipitation or temperature in the main drainage area.

*Former Floods.*

This stream has been subject to floods of some magnitude on a number of occasions in the past few years, practically every flood on the three main branches causing floods or high water on the main stream. At Saskatoon on June 17, 1908, the river reached a stage of 26.9 feet or 6 feet higher than in 1915. It is assumed by the city of Saskatoon that the flood of 1908 was the highest known at that point. At Medicine Hat it is believed that the flood of 1902 was the highest although no definite data are available. In 1908 the stream rose to within sixteen inches of the 1902 record. The 1908 record was 2142.68 feet above sea level (Canadian Pacific Railway datum). In 1897 a very high flood also occurred.

*Progress of the Flood.*

Plate B 1 shows the progress of the crest of the flood from the lowest stations on the three branches to the lowest station (Saskatoon) on the main river.

It is difficult to determine what stream caused the peak at the lower stations. For instance, it is hard to say if the maximum at Medicine Hat was caused by the waters of the Bow or Oldman River except by comparison of discharges. From them it would seem that the peak flood was caused by the Bow River and that it took twenty-four hours for the crest to pass the 168 miles between Bassano and Medicine Hat, at a rate of 7 miles per hour. The crest of the flood from the Oldman River apparently reached Medicine Hat about 9 a.m. June 28, or at a rate of approximately 7 miles per hour. From Medicine Hat to Saskatoon, a distance of 400 miles, there is a difference of 108 hours for crests which would allow the upper water to travel at a rate of about 4 miles an hour. The crest from Medicine Hat, however, apparently reached Saskatoon 18 hours earlier or at a rate of 4.44 miles per hour followed by the crest from the Red Deer River. It took 131 hours for the Red Deer crest to travel 600 miles or at a rate of 4.6 miles per hour. Hourly gauge heights and discharges during the flood are given in Table B 2 for Medicine Hat and B 3 for Saskatoon.

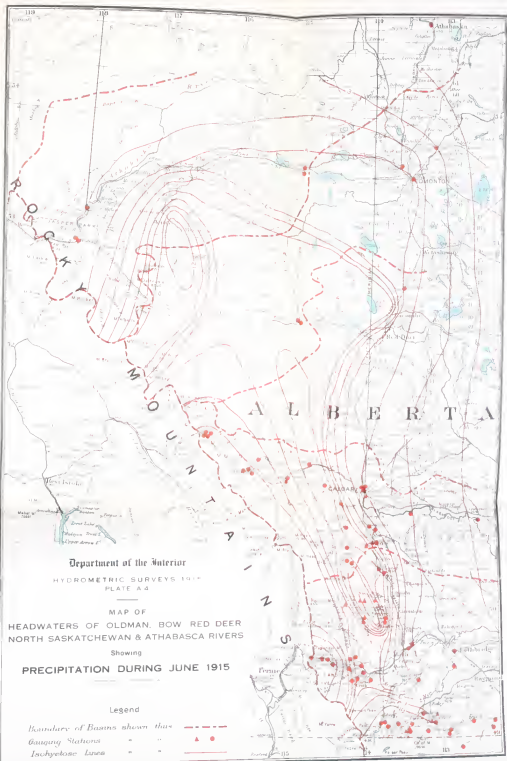
*Damage.*

There was little damage to property along this stream and there was no loss outside of some economic\* losses at Medicine Hat and Saskatoon.

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\*The damage caused by floods may be divided into two classes—actual and economic. Under "actual damage" are classed direct physical losses that are tangible and apparent, a portion of which may be measured in terms of the expenditure required to restore the thing damaged to approximately its condition before the flood; the rest may be measured in terms of the monetary value of the thing lost or destroyed. Under the classification "economic damage" are placed those indirect losses that are, in a sense, presumptive. These include losses due to suspension of business and social relations in the flooded area and in places having such relations with that area; losses due to decreased confidence in the security of the localities flooded—especially the towns and cities, which may be termed lost prestige; losses due to general depression and decreased initiative throughout the flooded districts; and losses due to a materially decreased property valuation. For a former use of these terms see page 86 of the Water-Supply, Paper 334, the Ohio Valley Flood of March-April, 1913, published by the U. S. Geological Survey.





Department of the Interior

HYDROMETRIC SURVEYS 1915  
PLATE A-4

MAP OF

HEADWATERS OF OLDMAN, BOW, RED DEER,  
NORTH SASKATCHEWAN & ATHABASCA RIVERS

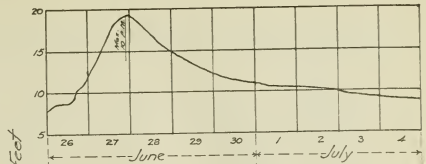
Showing

PRECIPITATION DURING JUNE 1915

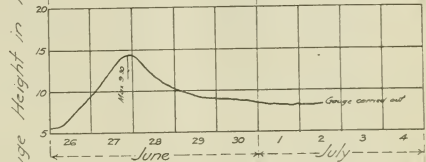
Legend

Boundary of Basins shown thus ---  
Gauging Stations " " ● ●  
Isohyetose Lines " " —

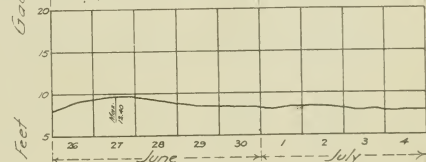
RED DEER RIVER  
At Red Deer  
600 Miles



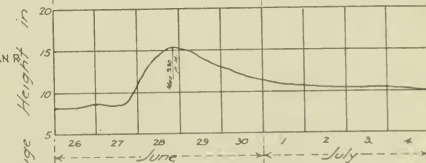
BOW RIVER  
Near Bassano  
568 Miles



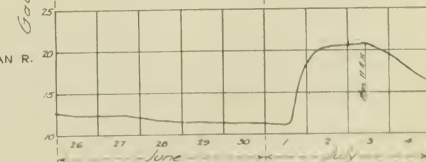
OLDMAN RIVER  
At Lethbridge  
552 Miles



SOUTH SASKATCHEWAN R.  
At Medicine Hat  
400 Miles



SOUTH SASKATCHEWAN R.  
At Saskatoon  
0 Miles



FLOOD HYDROGRAPHS (GAUGE HEIGHTS) FOR FIVE STATIONS  
IN SOUTH SASKATCHEWAN RIVER DRAINAGE BASIN, DURING  
JUNE AND JULY, 1915.

HOURLY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan River at Medicine Hat,  
for Flood, June-July, 1915.

TABLE B.2

Hour.	June 27.		June 28.		June 29.		June 30.		July 1.		July 2.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	8.47	30,350	11.15	49,200	15.23	89,220	12.85	63,990	11.48	51,770	10.72	45,920
2.....	8.45	30,220	11.60	51,930	15.20	88,880	12.75	63,050	11.45	51,540	10.70	45,770
3.....	8.45	30,220	11.85	54,760	15.15	88,370	12.70	62,580	11.42	51,310	10.68	45,620
4.....	8.44	30,160	12.20	57,880	15.10	87,740	12.60	61,640	11.37	50,920	10.67	45,540
5.....	8.43	30,090	12.55	61,170	15.05	87,170	12.55	61,170	11.33	50,600	10.65	45,000
6.....	8.42	30,030	12.90	64,460	15.00	86,600	12.45	60,230	11.30	50,370	10.63	45,240
7.....	8.42	30,030	13.30	68,430	14.90	85,490	12.40	59,760	11.25	49,980	10.62	45,170
8.....	8.41	29,960	13.55	70,960	14.80	84,380	12.30	58,820	11.20	49,590	10.60	45,020
9.....	8.42	30,030	13.75	72,980	14.50	81,050	12.20	57,880	11.15	49,200	10.59	44,950
10.....	8.45	30,220	13.90	74,490	14.35	79,380	12.15	57,410	11.13	49,050	10.58	44,870
11.....	8.50	30,540	14.10	76,610	14.20	77,720	12.10	56,940	11.10	48,820	10.57	44,800
12.....	8.55	30,860	14.25	78,280	14.05	76,060	12.05	56,470	11.06	48,510	10.55	44,650
13.....	8.65	31,520	14.45	80,500	13.92	74,690	12.00	56,000	11.03	48,280	10.55	44,650
14.....	8.73	32,040	14.65	82,720	13.80	73,480	11.95	55,580	11.00	48,050	10.53	44,500
15.....	8.83	32,680	14.80	84,380	13.70	72,470	11.90	55,170	10.97	47,820	10.52	44,430
16.....	8.93	33,340	14.95	86,040	13.60	71,460	11.85	54,760	10.93	47,510	10.51	44,350
17.....	9.05	34,120	15.08	87,510	13.50	70,450	11.80	54,350	10.90	47,280	10.50	44,280
18.....	9.20	35,110	15.20	88,880	13.42	69,640	11.77	54,100	10.87	47,050	10.50	44,280
19.....	9.30	35,780	15.28	89,790	13.35	68,940	11.73	53,780	10.85	46,900	10.50	44,280
20.....	9.50	37,140	15.30	90,020	13.25	67,920	11.69	53,450	10.82	46,670	10.50	44,280
21.....	9.80	39,250	15.30	90,020	13.18	67,220	11.65	53,120	10.80	46,520	10.50	44,280
22.....	10.15	41,740	15.30	90,020	13.10	66,410	11.60	52,720	10.77	46,300	10.50	44,280
23.....	10.50	44,280	15.28	89,790	13.00	65,400	11.56	52,400	10.75	46,140	10.50	44,280
24.....	10.80	46,520	15.25	89,450	12.92	64,650	11.53	52,170	10.73	46,000	10.50	44,280
Mean.....	33,593		76,261		76,866		56,981		48,591		44,780	
Run-off acre- feet.....	66,615		151,226		152,425		112,090		96,356		88,799	
Maximum....	46,520		90,020		89,220		63,990		51,770		45,920	
Minimum....	29,960		49,200		64,650		52,170		46,000		44,280	

HOURLY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan River at Saskatoon,  
for Flood, 1915.

TABLE B.3

Hour.	July 1.		July 2.		July 3.		July 4.		July 5	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	11.25	39,200	18.45	100,500	20.70a	114,000	19.57a	100,500	16.02a	71,300
2.....	11.22a	38,100	18.90	103,000	20.75	114,000	19.33a	98,300	15.93a	70,700
3.....	11.20	38,050	19.00	104,100	20.78a	114,000	19.10	96,000	15.84a	70,300
4.....	11.20a	38,650	19.20	105,500	20.80	114,000	19.00a	95,000	15.76a	69,700
5.....	11.20	38,650	19.40	106,800	20.80a	114,100	18.90a	94,000	15.67a	69,100
6.....	11.15a	38,650	19.65	108,500	20.80a	114,100	18.78a	93,000	15.58a	68,500
7.....	11.10	38,400	19.83	109,600	20.82a	114,100	18.68	91,700	15.50	67,800
8.....	11.08a	38,300	20.30	112,600	20.85	114,100	18.46a	90,100	15.42a	67,500
9.....	11.07	38,250	20.18	111,900	20.85	114,100	18.25	88,300	15.34a	66,600
10.....	11.12	38,500	20.23	112,100	20.85a	114,100	18.16a	87,500	15.26a	66,100
11.....	11.12a	38,500	20.26	112,500	20.85	114,100	18.00a	86,200	15.18a	65,600
12.....	11.12a	38,500	20.33	112,800	20.80	113,500	17.84	85,000	15.10	65,000
13.....	11.10a	38,700	20.38	113,000	20.73a	112,500	17.70a	83,600	15.08a	64,900
14.....	11.22	39,000	20.55	114,000	20.67a	111,500	17.55a	82,500	15.06a	64,800
15.....	11.54a	42,000	20.46	113,000	20.60	111,000	17.40	81,300	15.05	64,750
16.....	12.15	48,000	20.46	113,000	20.56	110,500	17.21a	80,000	15.02a	64,600
17.....	13.30	59,000	20.50	113,500	20.50a	110,000	17.02a	78,500	15.00	64,500
18.....	14.28	68,000	20.53a	113,800	20.40a	108,800	16.84a	77,000	14.98a	64,400
19.....	14.97a	74,000	20.57a	114,000	20.30a	107,800	16.66a	75,900	14.97a	64,350
20.....	15.75a	80,100	20.60	114,000	20.20	106,800	16.47	74,500	14.96a	64,300
21.....	16.47	86,000	20.60a	114,000	20.10a	105,700	16.38a	74,200	14.95a	64,250
22.....	16.96	89,600	20.60	114,000	20.00a	104,900	16.29a	73,200	14.94a	64,200
23.....	17.70	95,000	20.62a	114,000	19.90a	103,700	16.20a	72,500	14.93a	64,150
24.....	18.10	98,000	20.65	114,000	19.80	103,000	16.11a	72,000	14.92a	64,100
Total.....	1,279,150		2,664,200		2,664,400		2,030,800		1,591,500	
Mean for Day.....	53,298		111,008		111,017		84,617		66,312	
Run-off, acre-feet..	105,690		220,129		220,147		167,796		131,497	

a Gauge height interpolated.

## OLDMAN RIVER DRAINAGE BASIN.

*General Description.*

The Oldman River is the largest of the two streams which on their junction form the South Saskatchewan River.

The main river is formed between the Rocky Mountains and Livingstone Range by the junction of Livingstone River, Northwest Branch, West Branch and Race-horse Creek. It first flows southeasterly until joined by the Crownest and Castle Rivers and then flows in a general eastern direction to its junction with the Bow River. There are a number of small tributaries joining the main stream and two large ones, the Belly River and the St. Mary River. These two streams empty into the river between Macleod and Lethbridge.

The territory drained by this stream consists of mountains, foothills and prairie. The mountain region is quite extensive and is divided into the Main Range and the Livingstone Range of the Rocky Mountains. There is a good forest cover on many parts of the mountains and foothills, but much of the Livingstone Range and some parts of the Rockies are precipitous and bare of tree growth. On the higher peaks, considerable amounts of snow collect and thus the streams are subject to high water caused by melting snows during the heat of the summer and in the early spring.

The foothills are partially prairie and partially tree covered but do not consist of muskegs like large parts of the drainage areas of streams farther north. This portion is therefore not subject to such rapid run-offs as a muskeg country. Floods of exceptional magnitude only occur after exceptionally heavy rains.



*Former Floods.*

Records of former floods in this basin are not very extensive and it is only known that such floods occurred in 1897, 1899, 1902 and 1908, that of 1908 probably being the greatest this basin ever witnessed. At that time it has been estimated that the discharge at Lethbridge was 120,000 sec.-feet. No reliable data are available for this flood at Macleod or above that point, owing to the complete change of channel at most points where such data were obtained. At Macleod in May 1908 4.7 inches of rain fell, and in June, 6.8 inches as compared with 2.3 and 3.2 inches in 1915.

*Causes of Flood of June, 1915.*

During the storage period of 1914-15 there was not a very heavy precipitation except in October, 1914. This, however, came in the form of snow, and most of it went to run-off before it soaked into the ground to any depth. Therefore there was not very much ground water in storage or snow on the mountains when the rains of May started. During May from 2 to 6 inches of rain fell over most of this drainage area, and early in June a further amount fell, about equalling the total May precipitation. These rains, which took place almost daily, kept the atmosphere cool enough to stop any great amount of evaporation, so that the ground was thoroughly sodden by June 24 when the exceptionally heavy rains started and continued until June 27. Within this time a fall of 3 inches took place in a single day at Lyndon in this basin and as much as 1.6 inches at other points. This exceptional rain, which fell heaviest north of the Crowsnest Pass in the foothills, of course, could not be absorbed by the ground and rapidly passed into the drains, causing the high water on the Oldman River throughout its entire course. (See Introduction on Precipitation and Temperature.)

*Progress of Flood.*

The passage of the crest of the flood is shown in Plate B. 1. but it is impossible to give any definite data as to the time the crest took to pass down the stream, owing to the fact that the time of the highest water at the upper station is not known.

The following table gives date, approximate time, maximum stage and corresponding discharge at a number of stations on streams in this basin:

Stream.	Station.	Date.	Crest.		Discharge.
			Time.	Gauge Height.	
				<i>Feet.</i>	<i>Sec.-ft.</i>
Crowsnest River.....	Lundbreck.....	June 26	Noon	3.73	893
Oldman River.....	Cowley.....	" 26	p.m.	4.90	4,910
Castle River.....	Cowley.....	" 25	p.m.	4.30	2,460
Oldman River.....	Macleod.....	" 26-27	Midnight	8.40	10,280
Willow Creek.....	Macleod.....	" 26		9.28	3,959
Belly River.....	Stand Off.....	" 26	p.m.	5.20	2,700
St. Mary River.....	Lethbridge.....	" 26	noon	2.59	3,730
Oldman River.....	Lethbridge.....	" 27	12.40 p.m.	10.08	25,050

*Damage.*

The loss through the floods on the Oldman River were very small owing to the fact that the settlements are, with few exceptions, well above danger point.

**BOW RIVER DRAINAGE BASIN.**

*General Description.*

The Bow River is the smallest in size of the two main branches of the South Saskatchewan River.

The river receives its main supply from the eastern slope of the Rocky Mountains in the Rocky Mountain Park of Canada and the adjacent territory, being augmented by the run-off of the foothills and, to some slight extent, further by that of the prairies through which it flows after leaving the wooded regions of the foothills and mountains.

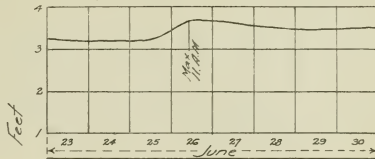
The main stream rises in Bow Lake, north of the Kicking Horse Pass, at an elevation of 6,420 feet above sea level and flows in a southerly direction until it strikes the main line of the Canadian Pacific Railway at the junction of the Pipestone River when it flows easterly to the mouth of the Elbow River in the city of Calgary. From Calgary it bends to the south and then continues in a southeasterly direction to its confluence with the Oldman (Belly) River at the Grand Forks forming the South Saskatchewan River.

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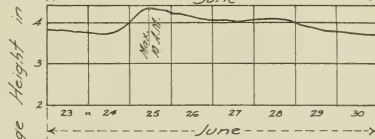
DEPARTMENT OF THE INTERIOR.

HYDROMETRIC SURVEYS-1915-PLATE C1.

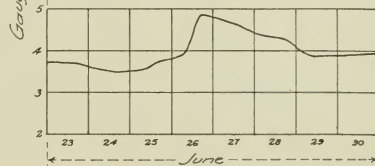
CROWSNEST RIVER  
at Lundbreck  
108 Miles



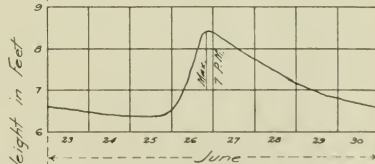
CASTLE RIVER  
Near Cowley  
105 Miles



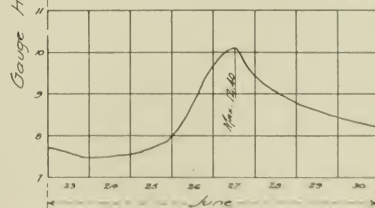
OLDMAN RIVER  
Near Cowley  
100 Miles



OLDMAN RIVER  
Near Macleod  
55 Miles



OLDMAN RIVER  
At Lethbridge  
0 Miles



FLOOD HYDROGRAPHS (GAUGE HEIGHTS) FOR FIVE STATIONS  
IN OLDMAN RIVER DRAINAGE BASIN, DURING JUNE, 1915

The Bow has a number of tributaries which drain large tracts of mountain and foothill regions lying to the north and south of that drained by the main stream. In the mountain section the river is joined by the Pipestone and Cascade Rivers from the north and the Spray and Kananaskis from the south. In the foothills it is augmented by the flow of the Ghost River from the north and Jumpingpound Creek, and then in the prairie section by the Elbow and Highwood Rivers from the south. Below the junction of the Highwood River little drainage finds its way into the stream.

One of the most noticeable characteristics of the Bow River drainage basin is the number of lakes on the main stream and its more westerly branches. On the main river at its head there are the Bow and Hector Lakes; on Louise Creek there is Lake Louise; on the Spray there are two Spray Lakes; on the Cascade, Lake Minnewanka, and on the Kananaskis the two Kananaskis Lakes, besides innumerable small lakes on the above mentioned and other smaller streams. The presence of these lakes and the forest cover over most of the mountain and foothill region have the effect of regulating the flow to a great extent, but despite these facts, the stream is subject to floods of some magnitude.

#### *Former Floods.*

The report of former floods on the Bow River, published in the "Progress of Stream Measurements for 1912," and written by Mr. P. M. Sauder, Chief Hydrometric Engineer, is complete and is incorporated verbatim herewith:

"The most destructive flood ever witnessed in the Bow River valley since its settlement occurred about the middle of June, 1897. It was brought about by a cloudburst near Castle Mountain, near Canmore, following an abnormal rainfall in the early part of June.

"It is stated that the greatest flood occurred in 1879, but no data regarding this flood are available.

"Another flood occurred in 1884, but inhabitants who witnessed both floods agree that the water was a foot higher in 1897 than in 1884.

"Another flood which almost equalled that of 1897 in magnitude and destructiveness occurred in the early part of July, 1902.

"Though the hydrographic records of this office date back to 1894, no systematic and continuous record of the stages and discharge of Bow River was kept until 1908. These records extend, with the exception of the winter months during the first two years, to date, but the only flood of any account during this period occurred in July, 1909. The maximum discharge at the bridge on the Calgary and Edmonton Branch of the Canadian Pacific Railway, in 1909, was about 23,000 sec.-feet on July 7.

"It is very hard to estimate the loss, but in running over the damage to gardens, fences, trees, houses, lots, streets, sidewalks, destruction of bridges, railway tracks, etc., the statement is ventured that the loss caused by the flood in 1897 totalled nearly a quarter million dollars in the vicinity of Calgary alone.

"The rainfall for the 14th, 15th, 16th and 17th June, 1897, totalled 2.94, or practically three inches in three days and a half. During the night of the 17th the river which was already swollen rose very rapidly, and before midnight overflowed its banks and flooded several houses on the flats south and west of the Langevin bridge. The city fire brigade and the North West Mounted Police turned out with teams and waggons, which were kept going nearly all night moving women, children and furniture from the flooded districts. In all, about sixty families were driven out of their homes.

"The Eau Claire power plant was flooded, and the dam, which still exists, was in grave danger. One span of the Bow Marsh bridge, which was just above the present Louise bridge in the West End of Calgary, was carried away and floating down the river intact struck a pier of the old Langevin bridge and broke up. Several houses and the Calgary Hydraulic Company's flume were also carried away by the flood. The middle pier of the old Langevin bridge sank but the bridge was not carried out, though it could not be reached at all from the south side.

"The Calgary and Edmonton bridge was not seriously damaged, but the water broke through the grade on the south bank and carried away a part of it.

"A fine residence on the south bank of the river, about two miles below the city and belonging to Colonel Walker, was dropped into the river by the banks caving in, and was carried to destruction, the water having cut into the bank for fifty feet or more.

"The bridge over the river on the main line of the Canadian Pacific Railway east of Calgary was not damaged and the water did not break through the grade. The railway, however, suffered very heavy losses at several places west of Calgary. At Shaginappi Point the track was washed out and a long stretch of it had to be re-located. From Calgary to Canmore the track and bridges were damaged and carried out at several places. The mines at Anthracite were wholly submerged.

"Fish Creek was also very high and at the mouth of this stream Bow River was reported to be twelve to fourteen feet above low water mark.

"Highwood and Sheep Rivers were also very high and did a great deal of damage. The trails were in a fearful condition and the whole country seemed to be covered with water.

"A bountiful rainfall during the latter part of June, 1902, and an abnormal downpour during the first few days of July resulted in a second very destructive flood. During the night of July 4, the river overflowed the flats to the south and west of the Langevin bridge in Calgary, and

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again the city fire brigade and North West Mounted Police came to the rescue of the unfortunate inhabitants with waggons and teams. Many barely escaped with their lives. The bridge was again cut off from the south by the flood and several buildings were damaged, but while the water was higher at this point than in 1897, the actual damage to property was not as great. Colonel Walker's barn had to be moved to save it from being carried away. A man named Wilson living on an island near the old Industrial School below the city had a narrow escape. He was rescued from the roof of his barn, which just showed above the water.

"The Canadian Pacific Railway again suffered much loss by grades and bridges being damaged and washed out. The water again broke through the grade south of the Calgary and Edmonton bridge, but the opening under the bridge on the main line east of the city again carried the floods. The Bow Marsh bridge was in grave danger but was saved by being lashed to its supports.

"The rainfall in Calgary for the month of May, 1902, was 8.90 inches, and in June 9.82 inches, while on July 4 and 5, 1.78 inches fell in twenty-four hours. The whole country was flooded and the Elbow and all tributaries of the Bow were exceedingly high.

"The records of this office indicate that at Langevin bridge the greatest height of the river in the 1902 flood was a couple of feet higher than in 1897, while the records of the Canadian Pacific Railway Division Engineer show that at the bridge on the main line east of Calgary it was several inches lower.

"Among the records of the office is an estimate of the maximum discharge at Langevin bridge during the 1897 flood of 54,000 sec.-feet. It is very difficult at this date with the data available to compute the discharge, but this estimate was made shortly after the flood and by experienced and intelligent engineers and is, no doubt, fairly accurate.

"The maximum flood discharge of Bow River at the Calgary and Edmonton bridge in 1897 would be 60,000 sec.-feet. The maximum discharge in 1902 did not quite reach this amount.

"History goes to show that Bow River is subject to very big floods, and in designing works, such as dams and bridges, a small amount at least should be added to the greatest known discharge. Between the mouth of Kananaskis River and Ghost River 40,000 sec.-feet should be allowed, between the mouth of Ghost River and Jumpingpound Creek, 50,000 sec.-feet; between the mouth of Jumpingpound Creek and Elbow River, 60,000 sec.-feet; between the mouth of Elbow River and Fish Creek, 70,000 sec.-feet; between the mouth of Fish Creek and Highwood River, 75,000 sec.-feet; and below Highwood River, 100,000 sec.-feet. This discharge averages 19 cu. ft. per sec. per sq. mile for the drainage area above Calgary, about 18 cu. ft. per sec. per sq. mile for the drainage area at the mouth of Highwood River. A run-off of 19 cu. ft. per sec. per sq. mile equals a depth of seven-tenths of an inch in twenty-four hours."

#### *Causes of Flood in June, 1915.*

The flood of June, 1915, was caused almost entirely by the heavy and continuous rains of June 25 to 27, which extended over the whole drainage basin. During late May and early June the basin was subject to heavy rainfalls which on the peaks fell as snow, saturating the soil cover of the mountains and foothills almost to capacity, and at the same time keeping the atmosphere in a cloudy and cool condition, thus not allowing the sun to melt the winter stores of snow as usual and reserving them to be melted by the heavy and warm rains of June 25-27. Fortunately the snowfall during the winter of 1914-15 was well below normal and while on the higher peaks there probably was as much snow as usual at this time, at the lower altitudes there was probably less.

A study of the Bow River drainage above Calgary shows that 46% of the area is at an elevation of 6000 feet above sea level, 43% between 4000 and 6000 feet and only 12% below 4000 feet. The area above 6000 feet can be taken as above timber line, and as it is of a rock formation with little soil cover, can be assumed to be of an impermeable nature which would shed a very large percentage of the rainfall as it fell. Between 4000 and 6000 feet may be taken as the timbered area on which the cover varies from heavy growths of coniferous to light growths of deciduous trees. This area is one which retards the run-off unless the ground is sodden, as was the case during 1915 due to the rains and slow evaporation of late May and early June. Under these conditions a fairly high percentage of the rainfall would immediately become run-off. The area under 4000 feet is practically all prairie, and like that of between 4000 and 6000 feet was not in late June of 1915 in a fit condition to retard more than a small quantity of the precipitation. The run-off of the upper portions of this basin was rather high. Those streams which enter the Bow above the Kananaskis all drain areas which for the most part are above 6000 feet in elevation, so might be expected to discharge a considerable part of the rainfall at the time of the flood. Louise Creek, draining an area of eleven sq. miles reservoirized by Lake Louise, had a mean discharge of 81 sec.-feet on June 26, and of 63 sec.-feet on June 27 to 30. This would be a run-off of 7.4 sec.-ft. per sq. mile on June 26, or a depth of 0.28 inches over the drainage area for a single day. The run-off of this stream could be expected to be low for a single day, owing to the reservoir formed by the lake. The Bow at Lake Louise with a drainage area of 165 miles had a maximum daily mean discharge of 2,985 sec.-ft. on June 26, or 18 sec. ft. per sq. mile equal to 0.67 inches over the area. The Spray River at Bauff with a drainage area of 225 sq. miles discharged 2300 sec.-ft., June 26, or 10 sec.-ft. per sq. mile, equal to 0.37 inches over the area. The Cascade was regulated to a certain extent by the dam and reservoir at Lake Minnewanka and the discharge was about the same as the Spray. The Kananaskis, with an area

of 390 sq. miles, discharged 5,380 sec.-ft., June 27, or 14 sec.-ft. per sq. mile, equal to 0.52 inches over the drainage area. The Ghost and Elbow Rivers drain areas which for the most part are above 4000 feet and they show the following flows for the mean maximum day; the Ghost on June 26 discharged 8,440 sec.-ft. or 22.5 sec.-ft. per sq. mile, equal to 0.84 inches over the area; the Elbow, on June 26, discharged 11,728 sec.-ft. or 25 sec.-ft. per sq. mile, equal to 0.93 inches over the area. Jumpingpound Creek, which drains an area of 185 sq. miles at an elevation of between 4000 and 6000 feet, with only a few square miles over 6000, had a maximum mean daily discharge of 5,784 sec.-ft. June 26, or 32 sec.-ft. per sq. mile, equal to 1.19 inches over the area. These records go to show that the greatest run-off took place from the area between 4000 and 6000 feet, or from the timbered section. This part of the drainage had little or no snow on it, therefore the run-off would be directly due to rainfall.

#### *Precipitation and Temperature.*

Meteorological stations are maintained at Lake Louise and Banff on the headwaters, and at Calgary, Pekisko, Okotoks and Brooks on the lower portions of the main stream or tributaries.

At Lake Louise (at an elevation 5,044 feet above sea level) the records for June show the mean temperature as 46.8 and the total precipitation as 5.70 inches, with a maximum for a single day of 2.17 inches. There were 18 days of rainfall with 0.01 inches or more and 12 fair days. At Banff (at an elevation of 4,512 feet) the mean temperature for June was 50.2, the total precipitation 6.05 inches, with a maximum fall of 1.97 inches. There were 20 days of rain and 10 fair days. These two stations would give the total average fall for the mountain region as being 5.88 inches, with a maximum fall for a single day of 2.07 inches and a mean temperature of 48.5 degrees. As both these stations are in the valley it may be assumed that for the higher elevations the precipitation was above this, and the temperature was lower.

The precipitation over the area between Calgary and Banff was rather heavy and probably was nearer the Banff records than those of Calgary. The rainfall, for instance, over the Jumpingpound catchment area, which is nearer to Calgary than to Banff, must have been greater than the mean of these two points. Assuming it as a mean of the heaviest fall at Banff and Calgary, it would be 1.32 inches and the run-off for the maximum day would therefore be 90% of the rainfall, which is exceptionally high. The area in the foothills is not covered by the meteorological records, and those of the border between the foothills and prairie show for this section a mean temperature for June of 50.8 degrees and a total precipitation of 6.54 inches and a mean daily maximum of 1.16 inches. The highest precipitation for the whole basin is shown at Pekisko, where the total for the month is 10.02 inches, with a maximum for a single day of 1.74 inches. Pekisko is just in the foothills and on the headwaters of Highwood River.

#### *Progress of the Flood.*

The progress of the flood is well shown by the graphs on plate D 1 and on table D4.

The streams entering the river in the mountain sections west of Banff began to rise June 25 and reached their maximum on June 26; those at and east of Banff in the same area reached their maximum June 27. The Ghost, Jumpingpound and Elbow began to rise during the night of June 25-26 and reached their maximum during the day of June 26. This allowed the floods on the lower streams to reach the main river and drain away before those of the upper streams reached the main river and more particularly the lower reaches of the main river. If conditions had been such that the western streams had emptied their maximum flows into the river at such a time as to allow their crest to be augmented by those of the lower streams, a vastly more destructive and serious flood would have resulted.

The crest on the main stream reached Lake Louise about 1 p.m. on June 26 and a stage of 9.54 feet, with an estimated discharge of 2,985 sec.-ft.; at Banff the crest arrived about 10.30 a.m. on June 27 and a stage of 10.39 feet, with an estimated discharge of 8,600 sec.-ft.; at Kananaskis about 10.30 a.m. on June 28 and a stage of 5.20 feet, with an estimated flow of 17,860 sec.-ft.; Calgary was reached at 5 p.m. June 26, with a stage of 11.15 (automatic record) or 12.50 (chain gauge record) and a flow of 39,780 sec.-ft. This is about 0.04 feet higher than the flood of 1902 and 1.95 feet lower than that of 1897. At Bassano the crest arrived at 8.30 p.m., June 27, with a gauge height of 14.70 feet and an estimated discharge of 69,156 sec.-ft.

The Pipestone reached its crest about 2 p.m., June 26, with a stage of 7.52 feet and a flow of 1,590 sec.-ft. The Spray reached its crest, June 26, with a stage of 7.55 feet and a flow of 2,318 sec.-ft. The Cascade, owing to the dam near Bankhead, did not reach its maximum until June 28, when the gates were opened. The Kananaskis was at its highest June 27, with a stage of 8.55 feet and a flow of 5,380 sec.-ft. The Ghost reached its peak June 26, with a stage of 10.17 feet and a discharge of 9,495 sec.-ft. Jumpingpound Creek about 8 p.m., June 26, reached a stage of 6.59 feet and a discharge of 5,784 sec.-ft. The Elbow about 6 p.m., June 26, was at a stage of 10.40 feet and a discharge of 13,850 sec.-ft. The Highwood River at High River reached its maximum stage about 6 a.m., June 26, at 9.85 feet with a flow of 9,300 sec.-ft. In addition to the flow through the river channel there were some 5,000 sec.-ft. diverted through Little Bow ditch and Lincham spillway at that time. Sheep River at Okotoks reached a stage of 10.80 feet, June 26, about 7 a.m., with a flow of 21,400 sec.-ft. The rate at which the flood travelled down the main river varied to some extent. From Lake Louise to Banff, a distance of 39 miles, it took 23 hours or at a rate of 1.7 miles per hour, the fall in this distance being about 11 feet per mile. The peak really reached Banff about 12 midnight, June 26-27 (it only



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rose a few hundredths after that), in 11 hours, or at a rate of 3.5 miles per hour. From Banff to Kananaskis, a distance of 28.5 miles, with a fall of 12 feet per mile, the flood took 24 hours, or at the rate of 1.2 miles per hour. The actual rate probably is higher than this, as no doubt the Banff peak arrived some hours earlier than the maximum crest. As the peak at Calgary arrived earlier than at Kananaskis it cannot be taken into consideration. From Calgary to Bassano, a distance of 115 miles, with a fall of about 7 feet per mile, the peak took 27½ hours or at a rate of 4.2 miles per hour. In this stretch there are three dams which would retard the rate of flow to some extent. These figures would show that the maximum peak travelled at a very slow rate down the stream, which is accounted for by the fact that the flood waters from the head of the main stream were increased by those of the lower tributaries after the first crest passed. A flood originating west of Banff should reach Calgary in from 30 to 50 hours, or at a rate of 6 to 4 miles per hour.

*Stage and Discharge.*

Plate D 1 shows the maximum gauge height and a graphic representation of the rise and fall at all stations on the Bow during the flood. Table D 4 shows the mean daily gauge height and discharge at these stations for June, 1915, and Table D 3 and D 5 show the hourly gauge heights and discharges during the flood on the Bow and Elbow Rivers at Calgary.

The maximum gauge height and discharge for the principal stations in the drainage area have been given elsewhere in this report or may be obtained from the plates or tables.

The total discharge in acre-feet during the flood period at the various stations is given on Table D 6.

*Damages.*

The damage caused by the flood of 1915 in this drainage basin was not great. At Lake Louise the stream flooded its banks but did no damage to property. At Banff the only damage was to cellars which were flooded by the flooding of Whiskey Creek, a branch of Fortymile Creek. This damage would not exceed \$1,000.00.

At Bankhead on the Cascade River the damage was quite extensive and included the destruction of the Canadian Pacific Railway dam and a traffic bridge at this point which it would cost at least \$10,000.00 to replace.

A large number of logs were lost on the Ghost River, but otherwise the damage done was small until Calgary was reached. At Calgary the chief losses from the Bow and Elbow Rivers was to city property and totalled \$47,840.00 divided as follows:

Public works, \$17,400.00; sewers, \$3,250.00; bridges, \$15,870.00; parks, \$1,020.00; water-works, \$7,800.00; and damage claims, \$2,500.00. The damage to private property was not very great although a number of cellars of residences, etc., along both streams were flooded. The chief loser was the Eau Claire Lumber Company which lost about \$30,000.00 worth of lumber and logs at Calgary and on the upper tributaries.

In addition to the above the Canadian Pacific Railway was put to considerable inconvenience and expense in keeping the diversion weir of their Western Section Irrigation Project clear of logs and debris.

Three lives were lost in Calgary during the flood. A workman, clearing debris from the new Mission (concrete) bridge over the Elbow, fell into the stream and was swept away. The second person to be drowned was a workman who was swept away with one of the spans of the Centre Street bridge. The third was an employee of the Canadian Pacific Railway who fell into the Bow while clearing the debris from their weir.

The Highwood River did not do any extensive amount of damage except to the intake of the Little Bow Ditch which would amount to perhaps \$1,000.00, and some slight amount of damage to the mill at High River.

Sheep Creek flooded the town of Okotoks from one to two feet but the damage to private property was not over \$2,000.00. The gas main of the Calgary Gas Company over Sheep Creek was destroyed, and, until temporarily replaced, cut off the supply to Calgary. In addition to this damage the Canadian Pacific Railway tracks along Sheep Creek were inundated and partly washed out. A rancher crossing Sheep River west of Okotoks was washed out of his wagon and drowned.

The Southern Alberta Land Company's dam near Carseland on the Bow was partially destroyed causing a loss of \$40,000.00.

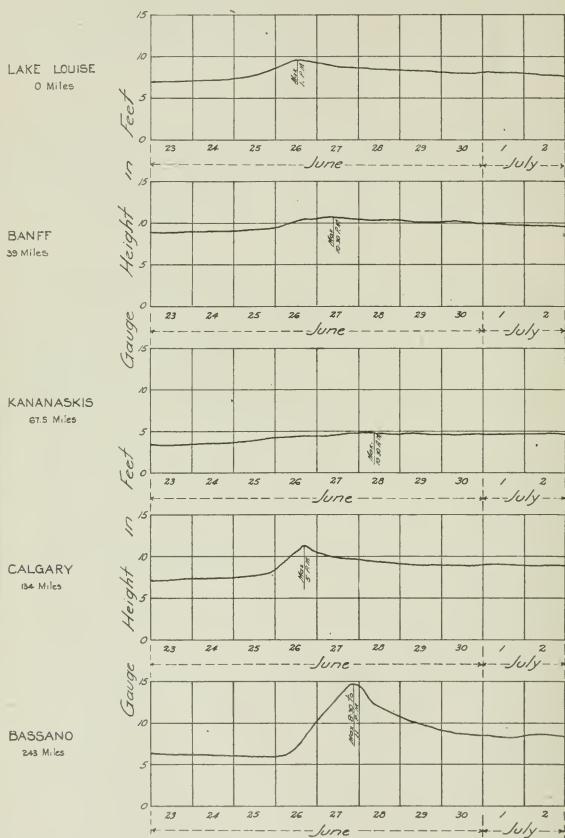
The total property damage over the Bow basin would be between \$150,000.00 and \$200,000.00 and the loss of life is placed at four persons. In addition to the above actual losses there were those economic losses caused by the cutting off of gas.

*Prevention of Damage by Floods in Bow Drainage Basin.*

The settlement and development of the Bow basin has had two opposite effects on the flow and stage of the streams during floods. The first is that common to all streams along which settlement takes place, namely, the encroachments on the stream channels by the building of structures close to the banks, filling in of parts of the flood channels to obtain more high land and the construction of bridges, piers, abutments, approaches, which reduce the natural flood channel. This encroachment confines the stream to a smaller channel, retards its free run-off

DEPARTMENT OF THE INTERIOR.

HYDROMETRIC SURVEYS - 1915-PLATE DI.



FLOOD HYDROGRAPHS (GAUGE HEIGHTS) FOR FIVE STATIONS  
ON BOW RIVER FROM JUNE 23 TO JULY 21, 1915.



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and thus has the effect of raising the stage during floods. The second effect is not found on all streams but on the Bow it is to some extent, that is the construction of reservoirs along the main stream and its branches. On the Bow there are at present six dams or weirs. That of the Calgary Power Company at Seebe and Kananaskis would reservoir a certain amount of water. Those of the Eau Claire Lumber Company and the Canadian Pacific Railway at Calgary would retard little water and are really obstructions rather than aids. The Southern Alberta Land Company's dam at Carseland and that of the Canadian Pacific Railway would control the flow to a certain extent. On Cascade River the Calgary Power Company have a dam which would retard most of the flow of this stream for a short period. The cleaning out of the gravel bars in the Bow and Elbow Rivers at Calgary during the past few years must have increased the channel to some extent.

The further construction of reservoirs, on the tributaries of the Bow in connection with power development and the protection of the forest areas will result in a slower run-off and if the encroachments into the channels are controlled there should not be the same dangers to settlements along the lower reaches of the stream from future floods.

MEAN GAUGE HEIGHT AND DISCHARGE for the day of maximum discharge for 10 Stations on Bow River Drainage Basin for years 1908-15.

TABLE D.2

		1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.
Bow River—Lake Louise....	Date .....				June 24	Aug. 25	June 11	July 15	June 26
	G.H. ....				3.48	8.56	8.74	8.50	9.54
	Disch. ....				2,063	1,886	1,936	1,940	2,955
Bow River—Banff.....	Date .....	July 7, 8	June 12	June 14	June 27	June 11	June 15	June 27	
	G.H. ....	5.00	4.35	4.70	3.56	4.62	4.29	10.33	
	Disch. ....	11,060	8,120	9,310	5,192	8,204	7,570	8,335	
Spray River—Banff.....	Date .....		July 18	June 18	June 17	June 11	June 19	June 26	
	G.H. ....		2.00	2.75	7.55	7.80	7.48	7.55	
	Disch. ....		1,510 <sup>b</sup>	2,640	2,530	2,960	3,041	2,300	
Cascade River—Bankhead...	Date .....					Aug. 18	June 11	June 5	June 28
	G.H. ....					3.47	4.54	4.28	4.66
	Disch. ....					1,695	1,240	1,400	2,607
Bow River—Kananaskis and Morley (c).	Date .....			June 18	June 25	July 14	June 13	June 18	June 28
	G.H. ....			5.80 <sup>c</sup>	6.45 <sup>c</sup>	3.84	4.65	4.37	4.90
	Disch. ....			13,090	13,545	8,308	11,150	10,422	13,780
Kananaskis River—Kananaskis.	Date .....					July 21	June 10	June 19	June 27
	G.H. ....					9.53	7.23	7.00	8.55
	Disch. ....					3,258	2,150	2,370	5,380
Ghost River—Gillies Ranch..	Date .....					July 8	June 27	June 13 July 6	June 26
	G.H. ....					4.80	3.30	3.83	10.17
	Disch. ....					1,695	1,225	348	8,440
Bow River—Calgary .....	Date .....	June 6	July 7	June 13	June 25	July 10	June 12	June 18	June 26
	G.H. ....					8.00	7.90	8.02	10.07
	Disch. ....	13,440	19,769	13,668	16,460	15,210	14,670	14,200	28,130
Elbow River—Calgary .....	Date .....	June 5, 6	June 3	June 12	June 1	June 16	Aug. 10	June 18	June 26
	G.H. ....	5.70	4.10	1.65	2.61	5.36	3.86	3.11	9.46
	Disch. ....	5,615	3,320	6.50	1,466	4,312	1,367	1,020	11,728
Bow River—Bassano. ....	Date .....				Aug. 9			June 13	June 27
	G.H. ....							6.49	14.70
	Disch. ....				22,780			14,340	69,156

a Discharge adjusted to represent discharge above mouth of Elbow river.

b Records start July 15, 1910.

## HOURLY GAUGE HEIGHT AND DISCHARGE of Bow River at Calgary for June Flood of 1915.

TABLE D.3

Hour.	June 24.		June 25.		June 26.		June 27.		June 28.		June 29.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	7.06	9,840	7.21	10,440	7.86	13,170	10.29	30,200	9.61	24,580	9.13	20,475
2.....	7.04	9,760	7.22	10,480	7.94	13,530	10.35	30,800	9.60	24,100	9.14	20,550
3.....	7.10	10,000	7.23	10,520	8.04	14,000	10.24	29,700	9.59	24,020	9.17	20,775
4.....	7.10	10,000	7.24	10,560	8.14	14,500	10.13	28,670	9.58	23,940	9.15	20,625
5.....	7.10	10,000	7.29	10,760	8.50	16,350	10.22	29,500	9.55	23,700	9.14	20,550
6.....	7.14	10,160	7.36	11,040	9.07	20,025	10.12	28,580	9.54	23,620	9.16	20,700
7.....	7.21	10,440	7.40	11,200	9.61	24,180	10.06	28,040	9.53	23,540	9.15	20,625
8.....	7.20	10,400	7.41	11,240	9.94	26,960	10.00	27,500	9.50	23,300	9.12	20,400
9.....	7.22	10,480	7.42	11,280	10.23	29,600	9.97	27,230	9.46	22,980	9.11	20,325
10.....	7.20	10,400	7.44	11,360	10.34	30,700	9.90	26,600	9.44	22,820	9.11	20,325
11.....	7.22	10,480	7.45	11,400	10.55	32,950	9.93	26,870	9.42	22,660	9.10	20,250
12.....	7.27	10,680	7.47	11,480	10.86	36,420	9.89	26,510	9.40	22,500	9.10	20,250
13.....	7.26	10,640	7.48	11,520	10.93	37,260	9.89	26,510	9.39	22,425	9.09	20,175
14.....	7.26	10,640	7.50	11,600	11.04	38,580	9.87	26,330	9.36	22,200	9.07	20,025
15.....	7.28	10,720	7.53	11,720	11.08	39,060	9.85	26,150	9.35	22,125	9.05	19,875
16.....	7.29	10,760	7.55	11,800	11.12	39,540	9.82	25,880	9.32	21,900	9.02	19,650
17.....	7.37	11,080	7.58	11,920	11.14	39,780	9.82	25,880	9.29	21,675	9.03	19,725
18.....	7.36	11,040	7.59	11,960	11.12	39,540	9.79	25,620	9.28	21,600	8.97	19,305
19.....	7.34	10,960	7.63	12,135	11.07	38,940	9.76	25,380	9.27	21,525	8.98	19,370
20.....	7.30	10,800	7.60	12,000	10.89	36,780	9.75	25,300	9.25	21,375	8.96	19,240
21.....	7.30	10,800	7.64	12,180	10.70	34,600	9.72	25,060	9.25	21,375	8.97	19,305
22.....	7.23	10,520	7.69	12,405	10.54	32,840	9.66	24,580	9.23	21,225	9.01	19,575
23.....	7.25	10,600	7.73	12,585	10.43	31,630	9.62	24,260	9.20	21,000	8.96	19,240
24.....	7.30	10,800	7.78	12,810	10.38	31,100	9.61	24,180	9.18	20,850	8.97	19,305
Mean.....	10,500		11,516		29,668		26,889		22,543		20,027	
Run-off acre- feet.....	20,822		22,836		58,832		53,321		44,703		39,714	

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DAILY GAUGE HEIGHT AND DISCHARGE of Bow River at all stations, for June 1915.

TABLE D.4

DAY.	Lake Louise.		Banff.		Kananaskis.		Calgary.		Carseland.		Bassano.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.36	450	8.08	1,998	2.89	3,426	5.72a	5,460	.....	.....	5.22	10,600
2.....	6.35	447	8.17	2,152	2.86	3,324	5.86	5,880	.....	.....	5.22	10,600
3.....	6.24	410	8.10	2,030	2.88	3,392	6.08	6,540	.....	.....	5.32	11,100
4.....	6.27	420	8.10	2,030	2.85	3,290	5.98	6,240	.....	.....	5.92	14,360
5.....	6.36	450	8.17	2,152	2.88	3,392	5.94	6,120	.....	.....	5.62	12,710
6.....	6.34	444	8.16	2,135	2.89	3,426	5.92	6,060	.....	.....	5.42	11,610
7.....	6.31	506	8.14	2,100	2.90	3,460	5.97	6,210	.....	.....	5.52	12,160
8.....	6.53	515	8.10	2,030	2.92	3,530	6.30	7,250	.....	.....	5.42	11,610
9.....	6.36	450	8.09	2,014	3.07	4,055	6.18	6,840	.....	.....	5.82	13,810
10.....	6.25	413	8.05	1,950	3.04	3,950	5.96	6,180	.....	.....	5.72	13,260
11.....	6.14	376	7.94	1,777	2.94	3,600	5.91b	6,030	.....	.....	5.62	12,710
12.....	6.10	363	7.92	1,746	2.87	3,358	6.14	6,520	.....	.....	5.32	11,100
13.....	6.24	410	7.96	1,808	2.86	3,324	6.10	6,400	.....	.....	5.22	10,600
14.....	6.35	447	8.05	1,950	2.87	3,358	6.11	6,430	.....	.....	5.22	10,600
15.....	6.51	506	8.18	2,170	3.14	4,304	6.21	6,735	.....	.....	5.32	11,100
16.....	6.74	606	8.33	2,447	3.10	4,160	6.33	7,155	.....	.....	5.22	10,600
17.....	7.10	792	8.71	3,212	3.17	4,412	6.75	8,625	.....	.....	5.22	10,600
18.....	7.01	740	8.70	3,190	3.58	5,888	7.44	11,360	.....	.....	5.52	12,160
19.....	6.85	658	8.61	3,001	3.50	5,600	7.42	11,280	.....	.....	6.72	19,120
20.....	6.74	606	8.61	3,001	3.48	5,528	7.37	11,080	.....	.....	6.92	20,320
21.....	6.73	602	8.50	2,780	3.44	5,384	7.25	10,600	.....	.....	6.92	20,320
22.....	6.77	620	8.52	2,820	3.45	5,420	7.10	10,000	.....	.....	6.72	19,120
23.....	6.96	713	8.67	3,127	3.45	5,420	7.10	10,000	.....	.....	6.52	17,920
24.....	7.09	786	8.77	3,544	3.47	5,492	7.23	10,520	.....	.....	6.42	17,320
25.....	7.65	1,168	9.07	4,109	3.61	5,996	7.50	11,600	.....	.....	6.22	16,120
26.....	9.54	2,985	10.14	7,670	4.24	8,492	10.07	28,130	.....	.....	6.52	17,920
27.....	8.74	2,201	10.33	8,335	4.53	10,070	9.93	26,870	.....	.....	14.70	69,156
28.....	8.35	1,819	9.97	7,075	4.90	13,780	9.39	22,425	.....	.....	12.26	53,833
29.....	8.06	1,538	9.81	6,515	4.84	13,024	9.06	19,950	.....	.....	9.79	38,321
30.....	7.96	1,443	9.76	6,340	4.65	11,000	8.88c	18,720	.....	.....	9.02	33,456

Bow river at Calgary a to b chain gauge heights, b to c auto gauge heights.

HOURLY GAUGE HEIGHT AND DISCHARGE of Elbow River at Calgary, for June Flood of 1915.

TABLE D.5

Hour.	June 24.		June 25.		June 26.		June 27.		June 28.		June 29.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	3.07	1,493	3.25	1,670	5.20	4,110	8.62	10,216	5.69	4,942	4.63	3,282
2.....	3.08	1,502	3.26	1,680	5.35	4,358	8.44	9,892	5.63	4,834	4.61	3,254
3.....	3.08	1,502	3.27	1,690	5.50	4,610	8.27	9,586	5.58	4,746	4.59	3,226
4.....	3.08	1,502	3.28	1,700	5.65	4,870	8.09	9,262	5.52	4,644	4.57	3,198
5.....	3.09	1,511	3.29	1,710	5.80	5,140	7.91	8,938	5.46	4,542	4.55	3,170
6.....	3.09	1,511	3.30	1,720	5.94	5,392	7.73	8,614	5.40	4,440	4.52	3,128
7.....	3.09	1,511	3.32	1,740	6.08	5,644	7.56	8,308	5.34	4,341	4.50	3,100
8.....	3.10	1,520	3.33	1,750	6.22	5,896	7.36	7,948	5.28	4,242	4.48	3,074
9.....	3.10	1,520	3.34	1,760	6.36	6,148	7.19	7,642	5.22	4,143	4.46	3,048
10.....	3.10	1,520	3.35	1,770	6.50	6,400	7.00	7,300	5.16	4,050	4.44	3,022
11.....	3.10	1,520	3.36	1,780	6.65	6,670	6.83	6,994	5.10	3,960	4.42	2,996
12.....	3.10	1,520	3.37	1,790	7.26	7,768	6.66	6,658	5.04	3,870	4.40	2,970
13.....	3.11	1,530	3.45	1,870	7.55	8,830	6.55	6,490	5.00	3,810	4.38	2,944
14.....	3.12	1,540	3.60	2,020	8.44	9,892	6.44	6,292	4.98	3,780	4.37	2,931
15.....	3.13	1,550	3.74	2,174	8.95	10,810	6.33	6,094	4.93	3,705	4.36	2,918
16.....	3.15	1,570	3.90	2,350	9.44	11,692	6.24	5,932	4.87	3,618	4.35	2,905
17.....	3.16	1,580	4.04	2,518	9.92	12,556	6.18	5,824	4.82	3,548	4.34	2,892
18.....	3.17	1,590	4.18	2,686	10.40	13,420	6.11	5,698	4.78	3,492	4.33	2,879
19.....	3.18	1,600	4.34	2,892	9.70	12,160	6.05	5,590	4.76	3,464	4.32	2,866
20.....	3.19	1,610	4.48	3,074	9.48	11,764	5.99	5,482	4.74	3,436	4.30	2,840
21.....	3.20	1,620	4.63	3,282	9.35	11,530	5.93	5,374	4.72	3,408	4.29	2,827
22.....	3.21	1,630	4.77	3,478	9.16	11,188	5.87	5,266	4.69	3,366	4.28	2,814
23.....	3.22	1,640	4.90	3,660	8.98	10,864	5.81	5,158	4.67	3,338	4.27	2,801
24.....	3.24	1,660	5.05	3,885	8.80	10,540	5.75	5,050	4.65	3,310	4.26	2,788
Mean.....	1,552		2,277		8,427		7,068		3,960		2,995	
Run-off, acre-feet.....	3,078		4,516		16,717		14,015		7,854		5,940	

FLOOD RUN-OFF FOR STREAMS IN BOW RIVER DRAINAGE BASIN FOR 1915.

TABLE D.6

Stream.	Station.	Period.	Run-Off in Acre-feet.	
			Tributary.	Main Stream.
Bath Creek.....	Lake Louise.....	June 26-27.....	1,600.....	.....
Bow.....	do.....	June 25-28.....	.....	16,000.....
Pipestone.....	do.....	June 26-28.....	6,900.....	.....
Forty Mile.....	Banff.....	June 25-July 2.....	6,000.....	.....
Bow.....	do.....	June 26-July 2.....	.....	95,000.....
Spray.....	do.....	June 25-July 1.....	29,000.....	.....
Cascade.....	Bankhead.....	June 26-July 9.....	56,500.....	.....
Bow.....	Kananaskis.....	June 26-July 3.....	.....	190,000.....
Kananaskis.....	do.....	June 26-July 1.....	47,500.....	.....
Ghost.....	Gillies Ranch.....	June 26-29.....	35,260.....	.....
Jumpingpound.....	Jumpingpound.....	June 25-30.....	29,500.....	.....
Bow.....	Calgary.....	June 26-July 8.....	.....	340,000.....
Elbow.....	do.....	June 26-28.....	44,000.....	.....
Fish.....	Priddis.....	June 26-29.....	22,500.....	.....
Sheep.....	Okotoks.....	June 26-29.....	85,000.....	.....
Highwood.....	Aldersyde.....	June 26-28.....	56,000.....	.....
Bow.....	Bassano.....	June 27-July 4.....	.....	615,000.....

## RED DEER RIVER DRAINAGE BASIN.

*General Description.*

The Red Deer River is the most northerly branch and is the largest tributary of the South Saskatchewan River. The river drains those portions of the eastern slope of the Rocky Mountains and the adjacent foothills and prairies between and east of the Bow River basin on the south and the North Saskatchewan River on the north.

A noticeable fact in connection with the drainage basin of the stream is that while its foothill region is fairly extensive, the mountainous portion does not cover a large area. This is due to the fact that the Bow and North Saskatchewan Rivers have a common divide west of the Red Deer and thus cut off the drainage from the main range of the Rocky Mountains.

Above the town of Red Deer, 14 per cent of the catchment area is above 6000 feet and 23 per cent is between 4000 and 6000 feet leaving 58 per cent under 4000 feet, of which perhaps half is forest covered and unlike the Bow drainage is not almost entirely prairie land.

The main river rises in the Sawback Range of the Rocky Mountains and flows easterly then northeasterly until near the town of Red Deer. It here turns southeasterly and enters the South Saskatchewan River just east of the boundary between the provinces of Alberta and Saskatchewan. The Panther and Little Red Deer Rivers are the most important tributaries in the foothills section and the Rosebud River in the prairie section.

This stream being partially mountain fed is, of course, subject to high water due to melting snows but floods on it seem to be almost entirely due to heavy rains.

*Former Floods.*

Few records of former floods on this stream are available and as regular gaugings have only been taken since 1911 no reliable data are available. Floods are known to have occurred in 1897, 1899, 1902 and 1908, but nothing is known of their magnitude. Old residents claim that the flood of 1915 was the greatest which ever occurred.

*Causes of Flood of June-July, 1915.*

The causes of the flood of 1915 were similar to those of the neighbouring streams, namely the heavy rains of June 24-27 on the already heavily saturated drainage basin. As the conditions on this basin are similar in most respects to the Bow and North Saskatchewan Rivers it is not considered necessary to further dwell on this part of the report.

*Precipitation and Temperature.*

There are only a few meteorological stations in the westerly portions of this drainage basin. It is, however, assumed that for the whole area, temperature for June was below the average and that the precipitation was above the average, varying from 5 to 9 inches with a probable mean of 7 inches over the entire area. (See Introduction *re* Precipitation and Temperature.)

At Red Deer the mean temperature for June was 51.6 degrees or 2.3° below the average, the total precipitation 4.81 inches or 0.18 above average with a fall of 2.11 inches on a single day.

At Lacombe the mean temperature was 52.6 degrees with a total precipitation of 8.28 inches. The heaviest fall for a single day was 2.20 inches.

*Progress of the Flood.*

The progress of the crest of the flood on the Red Deer River cannot be well judged as we had only the one station on the stream in June, 1915. The river at Red Deer began to rise early in the day on June 26 and reached its maximum stage of 19.05 feet with a discharge of 68,000 sec.-ft. about 9 p.m. on June 27. The crest of the discharge reached Drummheller about 10 p.m. on June 28, taking 25 hours to travel 125 miles, or at a rate of 5 miles per hour. The crest reached Empress some time late in the day on June 30, a distance from Drummheller of some 195 miles.

*Stage and Discharge.*

Table E 1 shows hourly gauge height and discharges for the six days during the flood at Red Deer.

The discharge in acre-feet during the flood at Red Deer was about 276,342 acre-feet, or 61 acre-feet per mile of drainage area.

While the Red Deer River was very high during this flood there was not a great deal of damage done to property. The water at Red Deer flooded the electric light plant of the town and washed out a section of street. At Drummheller the river was up to the lower chords of the Canadian Northern bridge.

## HOURLY GAUGE HEIGHT AND DISCHARGE OF Red Deer River at Red Deer, for Flood, June-July, 1915.

TABLE E. 1

Hour.	June 26		June 27		June 28.		June 29.		June 30.		July 1.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	7.9	9,300	12.40	26,500	18.9	67,200	14.9	40,300	12.2	25,500	11.1	20,250
2.....	7.9	9,300	12.70	28,000	18.8	66,500	14.7	37,100	12.1	25,000	11.1	20,250
3.....	8.0	9,600	13.10	30,000	18.7	65,800	14.6	38,500	12.0	24,500	11.0	19,800
4.....	8.0	9,600	13.50	32,150	18.6	65,100	14.5	37,900	11.9	24,000	11.0	19,800
5.....	8.1	9,900	13.90	34,375	18.4	63,700	14.3	36,700	11.9	24,000	10.9	19,350
6.....	8.2	10,200	14.30	36,700	18.3	63,000	14.2	36,100	11.8	23,500	10.9	19,350
7.....	8.3	10,500	14.70	37,100	18.1	61,600	14.0	34,950	11.7	23,025	10.8	18,900
8.....	8.3	10,500	15.10	41,540	18.0	60,900	13.9	34,375	11.7	23,025	10.8	18,900
9.....	8.4	10,800	15.50	44,100	17.8	59,500	13.8	33,800	11.6	22,550	10.7	18,450
10.....	8.5	11,100	16.00	47,300	17.5	57,400	13.6	32,700	11.6	22,550	10.7	18,450
11.....	8.6	11,400	16.40	49,940	17.3	56,000	13.4	31,600	11.5	22,075	10.6	18,000
12.....	8.7	11,700	16.80	52,580	17.1	54,600	13.3	31,050	11.5	22,075	10.6	18,000
13.....	8.8	12,000	17.20	55,300	16.9	53,240	13.2	30,500	11.4	21,600	10.6	18,000
14.....	9.0	12,600	17.60	58,100	16.7	51,920	13.0	29,500	11.4	21,600	10.5	17,575
15.....	9.1	12,900	18.00	60,900	16.5	50,600	12.9	29,000	11.4	21,600	10.5	17,575
16.....	9.3	13,600	18.50	64,400	16.3	49,280	12.8	28,500	11.3	21,150	10.5	17,575
17.....	9.5	14,300	18.70	65,800	16.1	47,960	12.7	28,000	11.3	21,150	10.6	18,000
18.....	9.8	15,350	18.80	66,500	15.9	46,660	12.7	28,000	11.3	21,150	10.6	18,000
19.....	10.1	16,450	18.90	67,200	15.7	45,380	12.6	27,500	11.2	20,700	10.7	18,450
20.....	10.4	17,650	18.95	67,550	15.6	44,740	12.5	27,000	11.2	20,700	10.7	18,450
21.....	10.8	19,250	19.00	67,900	15.5	44,100	12.4	26,500	11.2	20,700	10.8	18,900
22.....	11.1	20,475	19.05	68,250	15.3	42,820	12.3	26,000	11.2	20,700	10.8	18,900
23.....	11.6	22,700	19.00	67,900	15.2	42,180	12.3	26,000	11.1	20,250	10.8	18,900
24.....	12.0	24,500	19.00	67,900	15.0	40,900	12.2	25,500	11.1	20,250	10.8	18,900
Mean.....	13,569		51,582		54,212		31,544		22,223		18,697	
Run-off, acre-feet.....	26,907		102,287		107,502		62,551		44,068		37,076	

## NORTH SASKATCHEWAN RIVER DRAINAGE BASIN.

*General Description.*

The North Saskatchewan River draws its water supply from the eastern slope of the Rocky Mountains. The basin is bounded on the south by that of the Red Deer River and on the north by that of the Athabaska River. Its principal tributaries in the mountain district are the Clearwater and Brazeau Rivers. In addition to these there are a great number of smaller streams draining into the river. From the city of Edmonton the river takes a north and easterly course for about forty or fifty miles and then flows in an easterly direction to its junction with the South Saskatchewan River a few miles east of the city of Prince Albert, Saskatchewan. From this point it is known as the Saskatchewan River. The greater part of the drainage basin in the prairie section lies to the south of the river and the principal tributaries are the Vermilion and Battle Rivers, the former emptying into the main stream north and a little west of the town of Lloydminster and the latter at the town of Battleford.

In the mountain section the North Saskatchewan River and its tributaries have well defined rocky valleys with a large amount of fall and the whole drainage basin is well wooded. The valley of the stream widens out as it reaches the prairies into large fertile flats. The timber in this part of the drainage basin is confined mostly to the river valley. The stream bed changes from a rocky and fairly solid formation in the mountain district to a gravel, sandy and very unstable bed as the river comes out on to the prairies.

The stream receives the greater part of its water supply from the mountains. In consequence, the high water occurs in the hot months of summer, caused by the melting snow from the mountains. The low-water period occurs in the winter months when there is a minimum amount of drainage from the whole basin.

To obtain a clear idea of conditions in this drainage basin it is necessary to give a description of the principal characteristics of the different parts of the area. The basin naturally divides itself into five parts.

The first or upper part consists of the eastern slope of the Rocky Mountains. While this part of the basin is not the largest in area, the greater part of the run-off is derived from it. In glaciers and perpetual snows of the higher peaks innumerable small streams rise and flow



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eastward, forming large streams which empty into the main river. These streams are also fed by the melting of heavy snows and by rains which fall in the mountains at all seasons of the year. The region, being mountainous, has a tendency under these conditions to discharge a great quantity of water into the streams in a short time. This is seen each spring, as the mountains, being for the most part bare of vegetation, are exposed to the sun which melts the winter's snow in a short time. If this warm weather is accompanied by rain, floods take place. The lower parts of the mountains and the valleys have a good forest cover and they alone dampen the effects of warm weather. The streams in this part have a slope of from 20 to 500 feet per mile.

Below the mountain division are the foothills or second part of the basin. This is the largest in area of the five parts. Here the river heads northeasterly and is joined by a great many rivers of various sizes. The valley of the river becomes better defined and deeper. The country is hilly and rough but is not as broken as the first part. The whole region has a fairly heavy precipitation and is well covered with forest. Large tracts of muskeg are found in this region and while to a certain extent they have a tendency to make the run-off uniform if they become well saturated, they offer less resistance than bare hillsides to rapid run-off of heavy rains. The slope of the river in this section is probably from five to twenty feet per mile.

From near Edmonton to the mouth of the Vermilion River, the North Saskatchewan River flows through a park-like country with large stretches of prairie. Few tributaries flow into the few flats along the river. The slope of this section averages  $1\frac{1}{2}$  feet per mile.

The fourth section, from the Vermilion River to Prince Albert, is principally prairie with a few stretches of small timber and second growth. The valley of the river is much wider and the river itself widens out into shallow reaches full of shifting sand bars. Low-lying flats border the river for the greater part of the course. The slope of this section is half a foot per mile.

The fifth and last division is from Prince Albert to below the Grand Forks, or junction with the South Saskatchewan. This section has a slope of  $1\frac{1}{2}$  feet per mile, made up of a series of rapids. The valley is not as deep as in the two previous sections, and the river channel is better defined. The basin is covered with a fair tree growth with very little prairie land.

Below the fifth section, but on the main Saskatchewan River, is a section which consists of a chain of lakes and lagoons surrounded by low-lying lands and muskegs, covered with trees.

*Former Floods.*

From the conditions prevailing on the headwaters in the two upper sections it is seen that the North Saskatchewan River is liable to floods of a greater or less magnitude, and during practically each June or July the stage reaches a point which can be considered a flood period or borders closely on such condition.

Previous to 1915 the worst flood in the past fifty years, and in fact as far as records or memory goes, took place in August, 1899.

At that time the river reached a height equal to 41.37 feet on our gauges at Edmonton, or an elevation of 2034.75 feet, Public Works of Canada datum. This height gave a discharge of approximately 180,000 sec.-ft. from an estimate by Kutter's formula. At Prince Albert the gauge height reached was equal to 25.9 feet on the gauge or an elevation of 1481.997 feet, Public Works of Canada datum. This height gives a discharge of 160,000 sec.-ft. by Kutter's formula.

Stories at Prince Albert and Edmonton give records of higher floods, but both seem to have been caused by ice jams in the spring. The jam at Prince Albert is alleged to have taken place some 35 or 40 years ago, while that at Edmonton took place over 80 years ago.

In 1900 the river reached a gauge height equal to 37.9 feet on the gauge at Edmonton and did considerable damage. Since August, 1907, we have fairly continuous records, and the highest gauge height reached was 26 feet on July 10, 1912, the discharge on this date being about 75,000 sec.-ft.

During the floods of 1899 and 1900 considerable damage was done all along the river, but no actual figures are available. In 1899 the low-level bridge at Edmonton was in process of construction at the time of the flood and it was found necessary to raise the piers eight feet higher than at first proposed so as to provide for floods of such magnitude. The water reached to within one and one-half feet of the tops of the present piers at that time.

The cause of the flood of 1899 is rather hard to decide, but in the writer's opinion it can be accounted for by the excessive rains rather than by the melting snows. The meteorological records at Edmonton for August, 1899, gave 6.43 inches of rainfall or 4.63 inches above the monthly mean. The mean temperature was  $55.7^{\circ}$  or  $3.3^{\circ}$  below the monthly mean. It is very probable that these conditions prevailed to a greater degree in the two upper sections. It is usual to find that the snow has practically all melted by August and as rises had taken place in June and July of 1899 it is probable that this condition prevailed in that year. Therefore the assumption that this flood was caused by rains is borne out. During the whole summer the entire basin had a very heavy rainfall and in the two upper sections this rainfall would be stored to a certain point when it would run-off very rapidly and add much of the stored water to the exceptionally heavy rains of August.



*Causes of Flood of June-July, 1915.*

The direct cause of this flood was no doubt the heavy rainfall between June 24 and 27 on the already thoroughly saturated drainage area. This rainfall was especially heavy on the upper sections of the basin and in the three days there were fifty-eight hours of continuous rain and the fall is estimated at approximately six inches by Mr. O. H. Hoover, of this staff, who was on the headwaters of the main stream at that time. This precipitation on a country which at best does not retain much of the rainfall and which had already been thoroughly saturated by the heavy rains throughout the earlier part of the month caused sudden and excessive run-offs in a short period. The run-off from rain was added to by the rapid melting of the snows at this time.

Owing to the cloudy cold weather early in June the snows of the upper peaks did not melt as readily as ordinarily, and there was more than the usual amount of snow lying on the upper peaks on June 24. Fortunately the snowfall during the winter of 1914-15 was rather below the average.

An idea of the run-off of the upper section at this time can be gained by a study of the maximum discharge of some of the smaller streams in this locality. A very good example is the Mistaya River, a stream with a catchment area of some 130 square miles and on which there are six lakes which regulate the flow to a great extent. This stream reached a maximum discharge of 2,200 sec.-ft., on June 27, or 17 sec.-ft. per square mile of drainage area. This flow for a day would be equal to a run-off of 0.63 inches over the entire drainage area. At Wilson's ranch on the North Saskatchewan River in Tp. 36, Rge. 18, W. 5th Mer., the maximum daily flow was 21,000 sec.-ft. with a catchment area of 836 square miles. This works out as a run-off of 25 sec.-ft. per square mile or 0.93 inches over the drainage area for one day. While these run-offs are by no means records they are high for the eastern slope of the Rocky Mountains in Alberta.

*Precipitation and Temperature.*

Owing to the lack of settlement on the headwaters of the North Saskatchewan River, meteorological stations are not maintained and, therefore, no official records are available.

During June Mr. Hoover reported that there were eighteen days of rain and that during the whole of the early part of the month the temperature was low and the weather cloudy.

At Mountain Park (on the headwaters of the Macleod River at an elevation of 3,891 feet above sea level) the records for June show the mean temperature at 45.2 and the total precipitation as 12.26 inches with a maximum of 3.35 inches on a single day. There were twenty-one days on which 0.01 inch or more fell and nine fair days. At Banff (on the Bow River at an elevation of 4,534 feet above sea level) the records for June show the mean temperature as 50.2 or 1.1 degrees below the mean of twenty years, and the total precipitation as 6.05 inches or 2.86 inches above the average with a maximum fall of 1.97 inches on a single day. There were twenty days with 0.01 inch of rain or more, and ten fair days. As the mountains on the headwaters of the North Saskatchewan drainage lie midway between these two stations it may be assumed that a mean of their records could be assumed as an average for this part of the basin. The mean temperature thus obtained is 47.7° and the total precipitation 9.16 inches. Using in addition the records obtained at Red Deer (which is to the southeast of the headwaters of the North Saskatchewan) and those at Edmonton (on the northeast of the headwaters of the North Saskatchewan) we find that the mean temperature was 50.3 degrees and the mean total precipitation was 7.14 inches. As the catchment area of the headwaters of the North Saskatchewan River lies within the trapezoid bounded at the corners by Banff, Mountain Park, Edmonton and Red Deer, the records for these points should give a very fair average for the whole area. (See Precipitation and Temperature introduction.)

*Progress of the Flood.*

The progress of the crest of the flood down the stream is clearly shown by the graphs on Plates F 1 and F 2.

The most westerly streams rising in and draining the main range of the Rocky Mountains started to rise during the night of June 24-25 and reached their maximum about noon June 27. Those streams draining large areas east of the main range started to rise during the day on June 25 and reached their maximum about 10 a.m., June 27, or about the same time. This allowed the drainage of the lower altitudes to pass off before that of the higher reached the main stream.

The crest on the main stream reached Rocky Mountain House about 2 a.m., June 27, with a stage of 23.38 feet and an estimated discharge of 145,000 sec.-ft. At Rocky Rapids the crest arrived about 10 p.m., June 27, and Edmonton about 11 p.m., June 28, with a stage of 45.04 feet or 3.75 feet above any previous known stage and with an estimated flow of 204,500 sec.-ft. Battleford was reached about 5 p.m., June 30, Ceepee about 6 p.m., July 1, and Prince Albert at 1 p.m., July 2, with a stage of 26.42 feet, or 0.5 foot above the previous highest record, that of 1899, and a maximum discharge of 200,000 sec.-ft.

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The rate of progress of the flood seems to have varied very greatly. From Wilson's ranch in Tp. 36, Rge. 18, W. 5th Mer., to Saunders' siding in Tp. 40, Rge. 13, W. 5th Mer., a distance of fifty miles and an approximate fall in elevation of 13.4 feet a mile, it took some six hours, or at a rate of 8.33 miles per hour; from Saunders' siding to Rocky Mountain House, a distance of forty-five miles, with a fall of 12.5 feet per mile, it arrived some twenty-one hours earlier. This was no doubt due to the flood on Sheep and Clearwater Rivers arriving before that on the main stream. From Rocky Mountain House to Rocky Rapids, a distance of 80 miles with a mean fall of approximately 5.5 feet per mile, the crest took twenty hours, or at a rate of flow of four miles per hour; from Rocky Rapids to Edmonton, a distance of 102 miles, and a fall of 6.6 feet per mile, it took twenty-five hours, or a rate of flow of 4.1 miles per hour; Edmonton to Battleford, 320 miles, with a fall of 1.6 feet per mile, forty-two hours, or a rate of flow of 7.6 miles per hour; from Battleford to Ceepee, sixty miles, with a fall of 0.9 foot per mile, twenty-five hours, or a rate of flow of 2.4 miles per hour; from Ceepee to Prince Albert, 98 miles, with a fall of 0.9 foot per mile, nineteen hours, or a rate of 5.2 miles per hour; from Battleford to Prince Albert, a distance of 158 miles, forty-four hours or at a rate of 3.6 miles per hour; from Edmonton to Prince Albert it took eighty-six hours to travel the 478 miles, or at a rate of 5.56 miles per hour.

*Stage and Discharge.*

Plate F 1 shows the maximum gauge height at all stations affected by flood conditions in the drainage basin; also a graphic representation of the rate of rise and fall at most stations. Tables F 3 and F 4 show the main daily gauge heights and discharges at various stations for June and July, 1915, and tables F 5, F 6, F 7 and F 8, show hourly gauge heights and discharges at Edmonton, Battleford and Prince Albert for six days during the flood.

The maximum gauge height and discharge at the several stations has been given in the body of this report or may be obtained from the plates or tables.

The total discharge in acre-feet during the flood period at Rocky Mountain House was 885,874 acre-feet; at Edmonton 1,190,475 acre-feet and at Prince Albert 987,102 acre-feet.

*Damages.*

The total damages caused by the flood are hard to accurately arrive at owing to the impossibility of making an accurate and exhaustive survey of such damages.

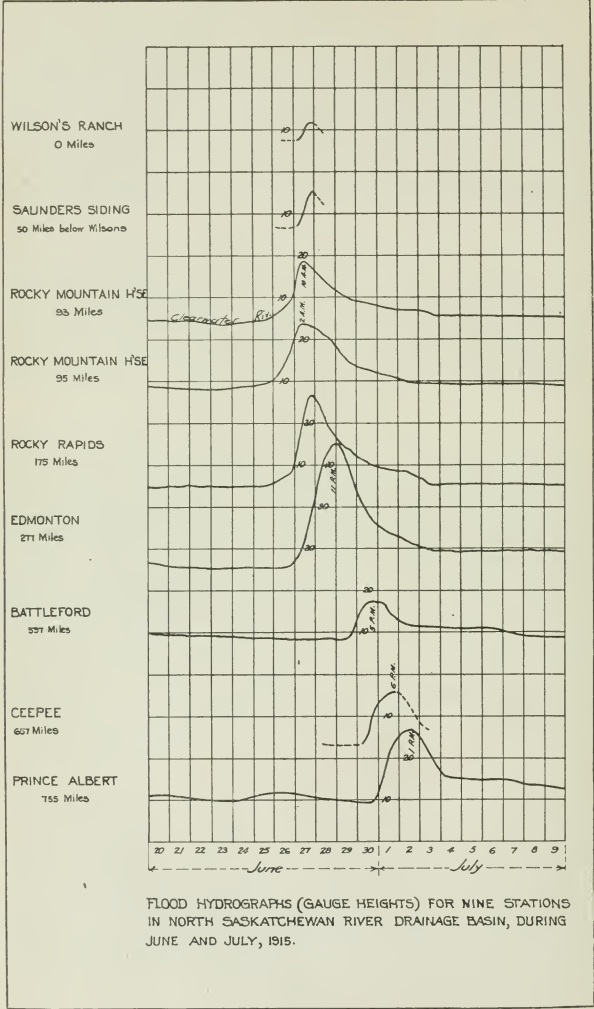
Above the mouth of the Clearwater River the only damages were to trails and to the grade of the Canadian Northern railway (Brazeau branch). These losses would total to at least \$30,000, principally to the railway whose grade was destroyed in a number of places. On the Clearwater River a new traffic bridge, about two miles from the mouth, was completely destroyed with a loss of \$2,500. At Rocky Mountain House the ferry was destroyed as well as the cable station of this branch. The cost of replacing the ferry was some \$1,000 and the cable station some \$150. The cable station at Rocky Rapids, owned by Sir John Jackson Company (Canada), was taken out, and it is estimated that it will cost at least \$1,000 to replace it. The greatest amount of damage done was at Edmonton where the direct losses are estimated at from \$500,000 to \$750,000; the loss to the municipality being \$17,500 caused by damages to sidewalks, roads and other property; the balance of losses being due to the inundating of the lower parts of the town known as Fraser, Ross and Mill Creek and Gallagher flats, the washing away of the Edmonton Lumber Company's mill and the destruction of booms belonging to the Edmonton Lumber Company and the Walters' mills. Many homes were destroyed and the damage to hundreds of others and their contents was very great. It is estimated that eight hundred families were rendered homeless by the flood. The loss of life was fortunately very light, the only casualty being an infant which was dropped by its mother from a floating side walk into the flooded street. The river began to flood over its banks at gauge height, 35.0 feet, at Edmonton and thus there was a depth of 10 feet of water at some points on the flats. The city electric light and pumping plants at Edmonton were out of commission for some hours owing to flooding of their boiler fires and this caused considerable inconvenience to numbers of businesses and residents in the higher parts of the city.

The damage to property along the river below Edmonton was not very great, a few farms along the flats were inundated and at Battleford several houses were flooded. At Prince Albert the principal damage was due to losses of logs which was well under \$10,000.

At Edmonton the low level bridge was in danger owing to debris such as buildings, sidewalks, logs and roots collecting on the piers and bridge stringers, but this structure was saved by clearing this debris away and by placing a loaded train on the bridge. The same procedure was carried out at Prince Albert where much debris collected on the piers. At Ceepee, the Canadian Northern Railway bridge approaches were damaged to some slight extent.

It is probable that the total actual damage on the whole stream amounted to between \$750,000 and \$1,000,000. In addition to the damage to property the stream channel at many points was completely changed. Banks and low flats were washed away and deposited at different points along the river and there is probably little of the river bed which was not changed to some extent. In general the river channel has been enlarged which will provide more room for such floods if they occur in the near future.

DEPARTMENT OF THE INTERIOR. HYDROMETRIC SURVEYS-1915-PLATE F.I.



FLOOD HYDROGRAPHS (GAUGE HEIGHTS) FOR NINE STATIONS IN NORTH SASKATCHEWAN RIVER DRAINAGE BASIN, DURING JUNE AND JULY, 1915.

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MEAN GAUGE HEIGHT AND DISCHARGE for the day of maximum discharge for 9 Stations on North Saskatchewan Drainage Basin for the years 1911 to 1915.

TABLE F.2

		1911.	1912.	1913.	1914.	1915.
Wilson's Ranch . . . . .	Date . . . . .					June 27
	G. H. . . . .					10. 61
	Disch. . . . .					21,176 <sup>a</sup>
Saunders Siding . . . . .	Date . . . . .					June 27, 28
	G. H. . . . .					15. 62
	Disch. . . . .					43,841 <sup>a</sup>
Clearwater River—Rocky Mountain House.	Date . . . . .				June 8	June 27
	G. H. . . . .				3. 80	17. 58
	Disch. . . . .				2,250	39,100
Rocky Mountain House . . . . .	Date . . . . .			Aug. 13	June 7	June 27
	G. H. . . . .			10. 80	9. 55	22. 10
	Disch. . . . .			22,750	18,000	129,700
Rocky Rapids . . . . .	Date . . . . .					June 27
	G. H. . . . .					26. 86 <sup>a</sup>
	Disch. . . . .					
Edmonton . . . . .	Date . . . . .	July 3	July 10	Aug. 15	June 9	June 28
	G. H. . . . .	21. 23	26. 00	17. 60	24. 00	42. 40
	Disch. . . . .	51,442	74,100	32,600	61,740	185,560
Battleford . . . . .	Date . . . . .		July 12	Aug. 19	June 11	June 30
	G. H. . . . .			N. 7. 96 S. 8. 84	N. 11. 99 S. 12. 60	N. 15. 08 S. 15. 21
	Disch. . . . .		65,716	29,550 <sup>b</sup>	64,234	
Cecpee . . . . .	Date . . . . .					July 1
	G. H. . . . .					15. 67 <sup>d</sup>
	Disch. . . . .					
Prince Albert . . . . .	Date . . . . .	July 10	July 14	Aug. 21	June 14	July 2
	G. H. . . . .	12. 00	15. 46	11. 03	14. 55	25. 98
	Disch. . . . .	42,200	69,880	35,665	63,290	186,546

<sup>a</sup> Maximum gauge height and discharge are shown, as means for the day of maximum discharge are not known.

<sup>b</sup> Discharge of 48,200 shown on June 17, and 31,797 on July 3, 1913.

<sup>c</sup> Insufficient data to support any estimate.

<sup>d</sup> Gauge maintained by Canadian Northern Railway.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at all Stations, for June 1915.

TABLE F.3

DAY.	Rocky Mt. House.		Rocky Rapids.		Edmonton.		Battleford.				Prince Albert.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	North Channel.		South Channel.		Gauge Height.	Dis-charge.
							Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.		
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1. ....	6.60	7,180	.....	19,100	14.5	20,240	5.68	8,080	6.95	7,560	6.22	9,940
2. ....	7.48	10,108	.....	23,000	13.7	17,420	5.70	8,160	6.98	7,650	6.46	10,810
3. ....	8.22	13,026	.....	40,000	14.6	20,600	5.76	8,390	7.04	7,830	6.64	11,510
4. ....	7.65	10,730	.....	37,000	18.6	37,580	5.83	8,650	7.10	8,020	6.98	12,870
5. ....	7.52	10,252	.....	29,000	17.8	33,900	5.90	8,920	7.15	8,180	7.15	13,580
6. ....	7.42	9,892	.....	24,200	16.0	26,120	6.01	9,340	7.25	8,500	7.02	13,030
7. ....	7.30	9,470	.....	21,500	15.0	22,080	6.10	9,740	7.36	8,850	7.16	13,620
8. ....	7.55	10,360	.....	22,500	14.3	19,520	6.20	10,180	7.47	9,200	8.26	18,470
9. ....	7.52	10,252	.....	44,000	14.6	20,600	6.32	10,710	7.60	9,660	9.65	25,110
10. ....	7.52	10,252	.....	40,000	19.2	40,420	6.45	11,280	7.75	10,200	11.10	33,860
11. ....	7.68	10,844	.....	36,100	18.6	37,580	6.68	12,400	7.95	10,920	10.86	32,300
12. ....	7.62	10,616	.....	32,700	17.6	32,980	7.25	15,350	9.22	16,670	9.97	26,840
13. ....	7.68	10,844	.....	29,500	17.0	30,320	9.55	30,490	10.20	22,250	9.52	23,410
14. ....	7.88	11,620	.....	26,800	16.3	27,380	9.30	28,620	10.02	21,080	9.16	22,630
15. ....	7.82	11,380	.....	25,400	15.7	24,880	9.35	28,990	10.10	21,600	10.23	28,380
16. ....	8.00	12,100	.....	23,100	15.3	23,280	9.34	28,920	10.10	21,600	12.38	42,660
17. ....	8.42	13,886	.....	30,000	15.2	22,880	9.18	27,730	9.96	20,720	11.74	38,180
18. ....	8.68	15,012	.....	34,500	16.2	26,960	9.10	27,140	9.95	20,660	11.14	34,120
19. ....	8.35	13,585	.....	31,000	17.1	30,760	8.95	26,050	9.81	19,870	10.63	30,830
20. ....	8.22	13,026	.....	28,700	16.5	28,220	8.72	24,440	9.60	18,670	10.38	29,280
21. ....	8.12	12,604	.....	25,700	15.9	25,700	8.50	22,900	9.38	17,490	10.14	27,840
22. ....	7.92	11,780	.....	25,000	15.4	23,680	8.28	21,490	9.15	16,310	9.98	26,890
23. ....	7.98	12,020	.....	24,200	15.5	22,480	7.97	19,520	8.55	14,860	9.79	25,870
24. ....	8.20	12,940	.....	25,600	15.0	22,080	7.60	17,300	8.50	13,250	10.17	28,020
25. ....	9.30	17,830	.....	26,500	15.3	23,280	7.32	15,730	8.35	12,600	10.90	32,560
26. ....	14.10c	48,100	.....	55,400	15.5	24,080	7.09	14,490	8.20	11,960	10.66	31,020
27. ....	22.10	129,700	.....	190,500	21.5	52,200	6.96	13,800	8.12	11,620	10.19	28,140
28. ....	20.80	115,600	.....	177,700	42.4	185,560	6.90	13,500	8.05	11,310	9.84	26,140
29. ....	14.40	58,000	.....	93,800	41.1	173,780	8.02	22,790	9.04	17,270	9.63	25,270
30. ....	12.40c	43,800	.....	64,000	27.5	81,900	15.08a	84,170	15.21	93,430	9.84	27,508

NOTE.—Owing to constantly shifting conditions, it is impossible to make accurate estimates of the discharge at Battleford during high water and flood stages, therefore the discharges given in this table for Battleford are only very approximate.

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DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at all Stations, for July 1915

TABLE F.4

DAY.	Rocky Mt. House.		Rocky Rapids.		Edmonton.		Battleford.				Prince Albert.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	North Channel.		South Channel.		Gauge Height.	Discharge.
							Gauge Height.	Discharge.	Gauge Height.	Discharge.		
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	10.80c	33,600		50,000	23.9	61,260	13.42a	71,880	14.24	70,810	20.40a	139,945
2	9.40	25,400		45,000	20.9	45,500	11.21	43,930	11.73	33,830	25.98a	186,546
3	9.20	24,300		44,500	19.7	39,560	10.46	38,500	11.04	28,010	20.66a	107,171
4	9.10	23,750		41,500	19.6	39,080	10.38	37,910	11.02	27,860	15.31a	64,000
5	9.10	23,750		40,700	19.3	37,680	10.34	37,670	11.01	27,780	14.51a	58,991
6	9.04	23,420		40,400	19.1	36,760	9.40	30,800	10.40	23,550	14.43	58,610
7	8.84	22,320		41,300	19.0	36,300	8.75	26,350	9.73	19,410	14.22	56,850
8	8.87	22,485		41,800	19.2	37,220	8.45	24,390	9.40	17,590	13.54	51,320
9	8.20	19,100		39,000	19.3	37,650	8.40	24,080	9.35	17,330	12.87	46,240
10	7.96	17,920		38,600	18.7	34,950	8.38	23,960	9.34	17,280	12.41	42,870
11	7.53	15,985		38,000	18.7	34,950	8.25	23,150	9.21	16,620	12.12	40,840
12	7.48	15,760		34,000	18.5	34,050	8.10	22,220	9.00	15,550	12.12	40,840
13	8.80	17,290		35,500	17.7	30,480	8.05	21,910	8.90	15,090	12.16	41,120
14	11.05	35,100		38,000	17.9	31,360	7.80	20,400	8.66	13,990	12.18	41,260
15	9.85	27,900		94,200	18.5	34,050	7.72	19,920	8.56	13,530	11.94	39,580
16	10.00	28,800	14.43	90,670	28.9	90,200	7.68	19,680	8.55	13,480	11.75	38,250
17	11.25	36,325	11.84	67,740	27.6	82,480	7.46	18,380	8.24	12,130	11.63	37,410
18	10.65	32,700	11.93	68,505	25.6	70,880	10.60	39,560	11.50	31,900	11.38	35,710
19	9.62	26,610	11.03	61,040	25.1	67,980	12.33	53,570	13.20	50,100	11.00	33,200
20	9.25	24,575	10.13	53,840	23.2	57,480	11.60	47,160	12.26	38,840	15.63	69,450
21	8.85	22,375	9.58	49,440	21.9	50,680	11.44	45,940	12.17	38,000	16.88	81,950
22	8.65	21,350	8.93	44,240	20.9	45,500	11.10	43,360	12.00	36,500	16.49	77,900
23	8.52	20,700	8.58	41,440	19.7	39,560	10.46	38,500	10.96	28,000	16.00	73,000
24	8.18	19,000	8.33	39,475	19.5	38,600	10.05	35,470	10.55	25,100	15.32	66,180
25	7.82	17,290	7.54	33,550	18.9	35,850	9.35	30,450	10.05	22,000	14.55	59,640
26	7.70	16,750	7.23	31,225	18.4	33,600	9.05	28,350	9.76	20,300	13.94	54,520
27	7.58	16,210	6.98	29,350	17.6	30,040	8.92	27,470	9.55	19,300	13.44	50,500
28	7.48	15,760	6.58	26,350	17.2	28,340	8.57	25,160	9.18	18,100	12.95	46,830
29	8.05	18,350	6.38	24,860	16.8	26,670	8.22	22,960	8.86	15,800	12.66	44,680
30	7.75	16,975	6.98	29,350	16.8	26,670	7.96	21,360	8.62	14,700	12.34	42,380
31	7.90	17,650	6.78	27,850	16.9	27,080	7.70	19,800	8.36	13,700	11.88	39,160

NOTE.—Owing to constantly shifting conditions, it is impossible to make accurate estimates of the discharge at Battleford during high water and flood stages, therefore the discharges given in this table for Battleford are only approximate.

HOURLY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Edmonton,  
for June-July Flood of 1915.

TABLE F.5

Hour.	June 26.		June 27.		June 28.		June 29.		June 30.		July 1.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>	<i>Feet.</i>	<i>Sec.-ft.</i>
1.....	15.50	24,080	16.9	29,900	30.80	105,400	44.8	202,640	33.0	116,000	25.3	69,140
2.....	15.56	24,080	17.1	30,760	31.60	110,320	44.4	199,520	32.5	112,800	25.1	67,980
3.....	15.50	24,080	17.3	31,640	32.40	115,280	44.2	197,960	32.1	110,240	25.0	67,400
4.....	15.50	24,080	17.5	32,520	33.20	120,280	43.8	194,840	31.6	107,040	24.8	66,280
5.....	15.50	24,080	17.7	33,440	34.00	125,400	43.5	192,500	31.2	104,480	24.7	65,720
6.....	15.50	24,080	17.8	33,900	34.80	130,680	43.2	190,160	30.7	101,340	24.5	64,600
7.....	15.50	24,080	18.0	34,820	35.60	136,080	43.0	188,600	30.3	98,860	24.3	63,480
8.....	15.50	24,080	18.7	38,040	36.40	141,520	42.8	187,040	29.8	95,760	24.2	62,920
9.....	15.50	24,080	19.4	41,400	37.20	146,960	42.6	185,480	29.4	93,280	24.1	62,360
10.....	15.50	24,080	20.1	44,920	38.40	155,200	41.9	180,020	28.9	90,200	23.9	61,260
11.....	15.55	24,280	20.8	48,560	39.20	160,880	41.0	173,000	28.5	87,800	23.8	60,720
12.....	15.60	24,480	21.5	52,200	40.10	167,540	40.3	167,540	28.0	84,800	23.7	60,180
13.....	15.65	24,680	22.2	55,880	40.80	172,720	39.5	161,400	27.6	82,480	23.6	59,640
14.....	15.70	24,880	22.8	59,120	41.40	177,160	38.8	156,160	27.1	79,580	23.4	58,560
15.....	15.75	25,080	23.5	62,900	42.00	181,600	38.0	150,400	26.9	78,420	23.3	58,020
16.....	15.80	25,280	24.1	66,180	42.60	186,040	37.2	144,640	26.7	77,260	23.2	57,480
17.....	15.85	25,490	24.6	69,080	43.10	189,700	36.6	140,400	26.6	76,680	23.1	56,940
18.....	15.90	25,700	25.3	73,140	43.70	194,320	36.2	137,600	26.3	74,940	22.9	55,880
19.....	15.95	25,910	26.1	77,780	44.10	197,360	35.7	134,100	26.2	74,360	22.8	55,360
20.....	16.00	26,120	26.9	82,420	44.40	199,640	35.2	130,600	26.0	73,200	22.7	54,840
21.....	16.20	26,960	27.7	87,060	44.70	201,920	34.8	127,840	25.8	72,040	22.6	54,320
22.....	16.40	27,800	28.5	91,700	44.80	202,680	34.4	125,120	25.7	71,460	22.4	53,280
23.....	16.60	28,640	29.3	96,400	45.04	204,500	33.9	121,760	25.6	70,880	23.3	52,760
24.....	16.70	29,060	30.0	100,600	45.04	204,500	33.5	119,200	25.4	69,720	22.2	52,240
Mean.....	25,215		57,223		163,643		162,855		87,651		60,057	
Run-off acre- feet.....	50,000		113,473		324,504		322,941		173,812		119,093	



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HOURLY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River (North Channel),  
at Battleford, for 1915.

TABLE F.6

Hour.	June 29.		June 30.		July 1.		July 2.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	6.93	15,550	13.10	60,920	15.52	89,680	12.20	52,400
2.....	6.94	15,600	13.40	63,980	15.51	89,540	12.09	51,410
3.....	6.94	15,600	13.85	68,850	15.50	89,400	11.98	50,430
4.....	6.95	15,650	14.20	72,860	15.50	89,400	11.88	49,570
5.....	6.95	15,650	14.55	77,050	15.40	88,060	11.75	48,450
6.....	6.96	15,700	14.70	78,920	15.25	86,050	11.65	47,590
7.....	6.97	15,750	14.90	81,440	15.10	84,040	11.54	46,640
8.....	6.97	15,750	15.10	84,040	14.90	81,440	11.45	45,880
9.....	6.98	15,800	15.25	86,050	14.70	78,920	11.36	45,120
10.....	6.98	15,800	15.43	88,460	14.50	76,400	11.28	44,450
11.....	6.99	15,850	15.45	88,730	14.30	74,040	11.20	43,780
12.....	6.99	15,850	15.46	88,860	14.05	71,090	11.10	42,940
13.....	6.99	15,850	15.48	89,130	13.90	69,400	11.00	42,100
14.....	7.00	15,900	15.49	89,370	13.70	67,200	10.92	41,440
15.....	7.00	15,900	15.49	89,370	13.50	65,000	10.84	40,790
16.....	7.00	15,900	15.50	89,400	13.30	62,960	10.82	40,620
17.....	7.65	19,500	15.60	90,820	13.10	60,920	10.80	40,460
18.....	8.30	23,460	15.59	90,680	12.90	58,940	10.80	40,460
19.....	9.00	28,000	15.58	90,540	12.80	57,980	10.78	40,300
20.....	9.65	32,580	15.58	90,540	12.70	57,020	10.76	40,140
21.....	10.35	37,690	15.56	90,260	12.60	56,060	10.75	40,060
22.....	11.00	42,600	15.55	90,110	12.50	55,100	10.74	39,960
23.....	12.05	51,050	15.54	89,970	12.40	54,200	10.72	39,800
24.....	13.00	59,900	15.52	89,680	12.30	53,300	10.70	39,640
Mean.....	22.790		84.170		71.880		43.930	
Run-off acre-feet..	45,193		166,909		142,538		87,113	

NOTE.—Owing to constantly shifting conditions, it is impossible to make accurate estimates of the discharge, during high water and flood stages, therefore the discharges given in this table are only very approximate.

HOURLY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River (South Channel),  
at Battleford, for 1915.

TABLE F.7

Hour.	June 29.		June 30.		July 1.		July 2.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	8.05	11,315	12.90	45,800	15.65	105,000	12.70	43,400
2.....	8.05	11,315	13.50	54,000	15.63	104,400	12.60	42,200
3.....	8.05	11,315	14.45	71,450	15.60	103,500	12.49	40,900
4.....	8.05	11,315	14.60	75,100	15.50	100,500	12.30	38,900
5.....	8.05	11,315	14.72	78,220	15.40	97,500	12.27	38,650
6.....	8.10	11,530	14.83	81,050	15.26	93,300	12.16	37,530
7.....	8.10	11,530	14.95	84,200	15.10	88,500	12.05	36,410
8.....	8.10	11,530	15.08	87,900	14.90	82,900	11.96	35,560
9.....	8.10	11,530	15.20	91,500	14.72	78,220	11.88	34,870
10.....	8.10	11,530	15.30	94,500	14.55	73,800	11.80	34,180
11.....	8.10	11,530	15.43	98,400	14.40	70,400	11.70	33,320
12.....	8.10	11,530	15.57	102,600	14.20	66,200	11.60	32,460
13.....	8.10	11,530	15.59	103,200	14.09	63,890	11.52	31,770
14.....	8.10	11,530	15.60	103,500	13.94	61,040	11.43	31,050
15.....	8.10	11,530	15.60	103,500	13.80	58,800	11.34	30,350
16.....	8.10	11,530	15.60	103,500	13.70	57,200	11.33	30,270
17.....	8.80	14,630	15.80	109,500	13.56	54,960	11.32	30,200
18.....	9.50	18,100	15.80	109,500	13.40	52,600	11.31	30,120
19.....	10.10	21,600	15.78	108,900	13.30	51,200	11.30	30,040
20.....	10.80	26,300	15.77	108,600	13.20	49,800	11.30	30,040
21.....	11.50	31,600	15.75	108,000	13.10	48,400	11.30	30,040
22.....	12.10	36,920	15.73	107,400	13.00	47,000	11.29	29,960
23.....	12.37	39,670	15.70	106,500	12.90	45,800	11.28	29,880
24.....	12.60	42,200	15.68	105,900	12.80	44,600	11.26	29,730
Mean.....	17.270		93.430		70.810		33.830	
Run-off acre-feet.....	34,246		185,272		140,416		67,085	

NOTE.—Owing to constantly shifting conditions, it is impossible to make accurate estimates of the discharge during high water and flood stages, therefore the discharges given in this table are only very approximate.

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HOURLY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan River at Prince Albert,  
for July Flood of 1915.

TABLE F.8

Hour.	June 30.		July 1.		July 2.		July 3.		July 4.		July 5.	
	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.....	9.64*	25,100	14.20	72,025	25.20	195,400	24.80	155,000	16.60	71,100	14.68*	60,380
2.....	9.63*	25,050	15.10	80,500	25.40	197,135	24.50	150,500	16.40	70,000	14.66*	60,260
3.....	9.63*	25,050	15.90	88,300	25.60	198,900	24.20	146,000	16.21	68,900	14.64*	60,140
4.....	9.63*	25,050	16.50	94,400	25.80	199,900	23.90	142,000	16.01	67,600	14.62*	60,020
5.....	9.62*	25,000	17.10	100,500	25.90	200,000	23.50	136,610	15.86	66,900	14.60*	59,900
6.....	9.62*	25,000	17.80	108,400	26.10	200,000	23.10	131,700	15.71	66,000	14.58*	59,700
7.....	9.62*	25,000	18.30	113,560	26.20	199,665	22.90	129,100	15.71	66,000	14.56*	59,500
8.....	9.62*	25,000	18.80	119,500	26.30	198,400	22.50	124,500	15.57	65,200	14.54	59,300
9.....	9.61	24,950	19.16	123,400	26.32	196,700	22.15	120,100	15.47	64,900	14.50	58,900
10.....	9.61*	24,950	19.70	130,300	26.35	194,500	21.70	114,680	15.32	64,000	14.49	58,835
11.....	9.61*	24,950	20.00	134,000	26.37	192,000	21.10	108,000	15.27	63,600	14.47	58,740
12.....	9.61*	24,950	20.50	140,100	26.39	189,300	20.70	104,000	15.22	63,500	14.46	58,660
13.....	9.61*	24,950	21.00	146,500	26.42	187,270	20.40	101,000	15.13	63,000	14.46*	58,580
14.....	9.60*	24,900	21.40	151,500	26.40	186,100	20.00	97,000	15.03	62,500	14.45*	58,500
15.....	9.60*	24,900	21.70	155,100	26.37	185,000	19.60	93,500	14.98	62,200	14.45*	58,500
16.....	9.60*	24,900	22.30	162,500	26.33	183,800	19.20	90,000	14.93	62,000	14.45*	58,500
17.....	9.60	24,900	22.70	167,100	26.25	181,800	18.80	86,500	14.93	62,000	14.44*	58,420
18.....	9.60*	24,900	23.00	170,600	26.20	180,500	18.40	83,230	14.84	61,500	14.44	58,420
19.....	9.60*	24,900	23.20	172,885	26.10	178,000	18.10	81,500	14.84	61,500	14.44*	58,420
20.....	9.60*	24,900	23.50	176,300	25.90	175,500	17.80	79,100	14.79	61,000	14.41*	58,420
21.....	9.60*	24,900	24.00	182,000	25.70	170,000	17.50	77,000	14.74	60,800	14.44*	58,420
22.....	9.66*	26,500	24.50	187,500	25.50	166,500	17.20	74,795	14.74	60,800	14.44*	58,420
23.....	11.76*	51,000	24.65	189,500	25.30	162,655	17.00*	73,800	14.70	60,500	14.44*	58,420
24.....	12.61*	58,500	24.90	192,200	25.10	160,000	16.80*	72,500	14.70	60,500	14.44*	58,420
Mean.....	27,508		139,945		186,546		107,171		64,000		58,991	
Run-off acre-foot.....	54,548		277,511		369,920		212,520		126,912		116,979	

\*Gauge heights before 1 a.m., July 1, and after 11 p.m., July 3, are interpolated from gauge heights observed at our gauge and at Public Works wharf.

## ATHABASKA RIVER DRAINAGE BASIN.

*General Description.*

Athabaska River rises on the eastern slope of Rocky Mountains and flows in a northeasterly direction for about one thousand miles, eventually emptying into Lake Athabaska.

The Athabaska basin forms the most southerly portion of the great Mackenzie system and the portion dealt with in this report comprises only the headwaters.

Rising in country very similar to the watershed of the other streams of importance in Alberta it flows out of the mountains and then through foothill country. From the foothills to the lake the basin consists of stretches of muskeg and uplands, well timbered with spruce and pine.

The general character of the basin is such that the winter precipitation or snow cover is conserved to a great extent and floods in the early spring are not usual. However, in June, July and August, rains and warm winds cause the upper parts of the system to discharge large quantities of the snow water from the higher peaks and glaciers and when rains of any magnitude occur the invariable result is a flood. The muskeg country is a great source of storage, but when its capacity is reached, it accelerates rather than retards the run-off.

The principal tributaries of the upper part of this stream from its headwaters eastward entering from the south are Maligne, Rocky, Macleod and Pembina Rivers, and from the north and west Whirlpool, Miette, Snaring, Stony and Baptiste Rivers. Lower down on its course it is augmented by the Lesser Slave, Moose, Clearwater Rivers and a number of lesser streams.

*Former Floods.*

No records of previous floods on this stream are available although such floods are known to have occurred. That of 1899 probably was the largest in recent years.

Mr. Swift, the oldest resident of the Yellowhead pass, stated that the flood of 1915 was the largest he has witnessed at Jasper; however, at Athabaska it did not reach as high a stage as previous floods.

*Causes of the Flood of June, 1915.*

The precipitation on the headwaters of the Athabaska and those streams rising south of the Yellowhead Pass was high in June and on the headwaters of the Macleod at Mountain Park reached the excessive total of 12.26 inches, with a fall of 3.35 inches on a single day. This was probably over a small area only but may have covered a larger extent. The conditions of this part of the basin were similar to those to the south and were therefore in fit condition for rapid run-offs. (See Introduction *re* Precipitation and Temperature.)

*Progress of the Flood.*

The Athabaska at Jasper began to rise on June 25, and reached its maximum about 4 a.m., June 27, with a stage of 10.20 feet and flow of 19,500 sec.-ft. The Macleod at Thornton began to rise June 26, and was at its crest June 27, about 10 p.m., with a stage of 14.13 feet and flow of 23,850 sec.-ft. The Athabaska at Athabaska began to rise on June 28 and on June 30 at 6 a.m. reached a stage of 16.5 feet with a discharge of 101,800 sec.-ft. Plate G 1 shows the progress of the crest of the flood down the stream in a clear manner.

*Damages.*

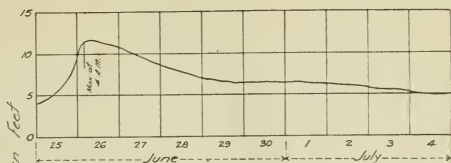
The floods in this basin did not do a great deal of damage as there is little settlement close to the banks of any of the streams. The tracks of the Grand Trunk Pacific and Canadian Northern railways along the Athabaska were damaged to some extent by washouts and slides.

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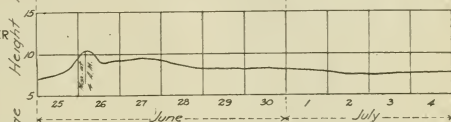
DEPARTMENT OF THE INTERIOR.

HYDROMETRIC SURVEYS—1915—PLATE G1.

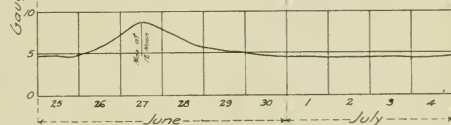
MIETTE RIVER  
Near Jasper  
383 Miles



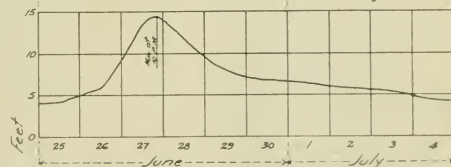
ATHABASKA RIVER  
At Jasper  
379 Miles



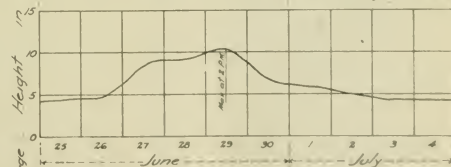
ROCKY RIVER  
At Hawes  
361 Miles



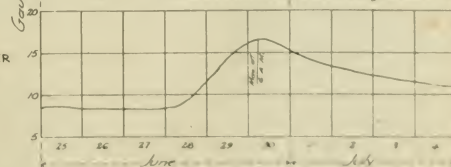
MACLEOD RIVER  
At Thornton  
284 Miles



PEMBINA RIVER  
At Entwistle  
254 Miles



ATHABASKA RIVER  
At Athabaska  
0 Miles



FLOOD HYDROGRAPHS (GAUGE HEIGHTS) FOR SIX STATIONS  
IN ATHABASKA RIVER DRAINAGE BASIN FROM JUNE 25 TO  
JULY 4, 1915.



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